Fish Biological Assessment and Evaluation, Essential Fish Habitat and Management Indicator Species Report

Trinity County Roads and Plantations Pilot Project

U.S. Forest Service, Shasta-Trinity National Forest

South Fork Management Unit: Hayfork Ranger District

Shasta-Trinity National Forest

Trinity County, California

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SHASTA-TRINITY NATIONAL FOREST

South Fork Management Unit, Hayfork Ranger District

PROJECT NAME: Trinity County Roads and Plantations Pilot Project (Pilot Project)

LOCATION: Adjacent to Indian Valley (2N10) and Butter Meadows (3N08) Roads and within and adjacent to proximal plantations

ADMINISTRATIVE UNIT: Shasta Trinity National Forest.

FOURTH FIELD WATERSHED: Trinity River

FIFTH FIELD WATERSHED: South Fork Trinity River

SIXTH FIELD WATERSHEDS; Butter Creek, Rusch Creek, West Tule Creek

WATERSHED ANALYSES: Butter Creek Watershed Analysis, Hayfork Ranger District, Shasta Trinity National Forest, December 1994; Lower Hayfork Creek Watershed Analysis, Shasta Trinity National Forest, March 1996.

NEPA DOCUMENTATION: Pilot Project Draft EA, November 2019

ESA SPECIES CONSIDERED: Southern Oregon/Northern California Coast (SONCC) Coho salmon (Oncorhynchus kisutch) Evolutionarily Significant Unit (ESU)

ESA CRITICAL HABITAT CONSIDERED: Southern Oregon/Northern California Coast (SONCC) Coho salmon Critical Habitat (CH)

USFS SENSITIVE SPECIES CONSIDERED:
Klamath Mountains Province (KMP) winter steelhead trout (Oncorhynchus mykiss), Upper Klamath-Trinity (UKT) Rivers Chinook salmon (O. tshawytscha), Pacific lamprey (Entosphenos tridentatus)

ESSENTIAL FISH HABITAT: Chinook and Coho salmon Essential Fish Habitat (EFH)

MANAGEMENT INDICATOR FISHES: Winter and summer run steelhead, Spring Run Chinook salmon (anadromous fish assemblage) and rainbow trout (O. mykiss; Inland coldwater fish assemblage).

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INTRODUCTION

This Biological Assessment/Biological Evaluation, Essential Fish Habitat (EFH) and Management Indicator Species (MIS) report (BA/BE, report) is intended to determine effects of the Trinity County Roads and Plantations Pilot Project (Pilot Project) on the Shasta-Trinity National Forest's (Forest; STNF) fish species conceivably influenced by this proposed action. The fishes or habitat analyzed are one or more of the following: 1) the Southern Oregon Northern California Coasts Evolutionarily Significant Unit (SONCC ESU) coho salmon and its designated Critical Habitat (CH) - listed under the Endangered Species Act (ESA) as Threatened; 2) Essential Fish Habitat (EFH) for Chinook and coho salmon; 3) fish species listed as "Sensitive" by the Pacific Southwest Region of the U.S. Department of Agriculture (USDA) Forest Service potentially found in or near the Project area; and/or 4) are designated Management Indicator Fish Species as described by the Forest's Land and Resource Management Plan (LRMP) that could be affected by implementation of the Pilot Project.

The Pilot Project area featured in this document is the 5th and 6th field watersheds listed on page two managed by the STNF. From the Pilot Project Physical Sciences Report (2019): "Sub-watersheds in the project area include Butter Creek, Grassy Flat – Miners Creek, Rusch Creek – Little Creek, Tule Creek – Hayfork Creek, and Sulphur Glade Creek – Waldorf Flat. Most of the Project area lies within the sixth field Butter Creek sub-watershed. Larger watersheds in the Project area include Lower Hayfork Creek and Middle South Fork Trinity River. Perennial streams in the project area include Indian Valley Creek, Butter Creek, Rusch Creek, and West Tule Creek. Indian Valley Creek and Butter Creek drain to the South Fork Trinity River. Rusch Creek and West Tule Creek drain to Hayfork Creek, the main tributary to the South Fork Trinity River."

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. This includes reaches of streams 'downslope' from the Pilot Project area that could be affected by the proposed action.

This BA/BE has been prepared in accordance with legal requirements set forth under Section 7 of the ESA of 1973, as amended (16 United States Code [USC] 1531 et. seq.; 50 Code of Federal Regulations [CFR] 402). The Sensitive species are determined from the USDA Pacific Southwest Region Sensitive Species list, July 2013. EFH consultation is occurring under 305(b)(4)(A) of the *Magnuson-Stevens Fishery Conservation and Management Act*; and is consistent with standards established in Forest Service Manual direction (FSM 2672.42; USDA Forest Service 2009). The MIS fish species addressed are listed on page 3-11 of the Forest's LRMP (1994).

Relevant Laws, Regulations and Policies

Endangered Species Act Endangered Species Act (ESA) listing for SONCC coho salmon occurred as Threatened in 1997 (62 FR 24588; May 6, 1997) and Critical Habitat (CH) was designated in 1999 (64 FR 24049; May 5, 1999). Designated CH for SONCC coho salmon encompasses reaches of all rivers (including the Klamath River basin, estuarine

areas, and tributaries) between and including the Mattole River in California to the Elk River in Oregon. Coho salmon CH includes the entire mainstem Trinity River starting with the confluence with the Klamath River upstream 109 miles to the base of Lewiston Dam along with major tributaries. Most of the mainstem of the South Fork Trinity River and at least the lower reaches of major tributaries such as Hayfork Creek are coho salmon CH as well, albeit unoccupied most of the time (NMFS 2014).

Sensitive Species. The Forest Service definition and description of Sensitive Species (Forest Service Manual at 2670.5) is: "Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by a) Significant current or predicted downward trends in population numbers or density; and b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Sensitive species must receive special management emphasis to ensure viability and to preclude trends toward endangerment that would result in the need for Federal listing". Biological Evaluations (FSM 2672.4) must be written whenever appropriate to ensure that Forest Service actions do not contribute to loss or viability of any native Sensitive-listed plant or animal species or trends toward Federal listing of any of the Sensitive-listed species. Analysis of all the Sensitive fish listed at the beginning of this report will be conducted concurrently. The Region 5 Sensitive Species list was revised in 2013.

Essential Fish Habitat. In addition to CH designations for SONCC coho salmon, Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act (MSA) require heightened consideration of habitat for commercial fish species in resource management decisions, including EFH for SONCC coho salmon and UKT Rivers Chinook salmon. EFH is defined in section 3 of the MSA as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." National Marine Fisheries Service (NMFS) interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem. The MSA and its implementing regulations at 50 CFR 600.92(j) require that before a federal agency may authorize, fund or carry out any action that may adversely affect EFH, it must consult with NMFS. The purpose of the consultation is to develop conservation recommendations that address reasonably foreseeable adverse effects to EFH. Freshwater EFH for Pacific salmonids includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically, accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and long-standing impassable natural barriers. In the project area, EFH and CH are coincident. Analysis of CH or any anadromous fish habitat will include concurrent analysis of EFH.

Management Indicator Fish Assemblages and Species. From the STNF's Land and Resource Management Plan (LRMP, 1994): "Fish species have been grouped into specific assemblages or groups to simplify tracking the effects of Forest Service management activities on fish habitats. Three assemblages have been established. These are: (1) Fish Habitat – Anadromous Assemblage, (2) Fish Habitat – Inland Cold Water Assemblage, and (3) Fish Habitat – Inland Warm water Assemblage." Winter-run

and summer-run steelhead were chosen as well as spring-run Chinook salmon as management indicators for the anadromous fish assemblage. The rainbow trout was selected for the inland cold water fish assemblage. This Pilot Project and action area includes habitat assemblages numbered one and two. No inland warm water fish habitat occurs in the project area.

Project Background

National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires an environmental assessment (EA) for proposals that are not categorically excluded from documentation and for which the need of an environmental impact statement (EIS) has not been determined. An EA must provide sufficient evidence and analysis to determine whether to prepare an EIS or a finding of no significant impact.

From the Pilot Project EA (2019):

"Vegetative communities in the project area vary from late-seral Klamath mixed-conifer, ponderosa pine, and oak woodlands, to early-seral stands and single storied plantations. This variety of vegetative communities provides habitat for Northern spotted owl and numerous other species of concern. Implementing strategic forest thinning along roads and within and adjacent to plantations is needed to help reduce the threat of negative impacts from wildfire balanced with accelerating the development of late seral stage forest conditions in plantations. It would also reduce the risk of high-severity fire in the untreated areas. This project will complement the Westside Plantation Project and the Middle Hayfork Pre-Commercial Thin project that thin plantations near the project area.

Currently, plantations are overgrown and in need of maintenance to reduce competition from shrubs and brush, as well as other conifers. Too much vegetative competition stunts growth, delaying achievement of late successional characteristics, and increases risk of mortality to insects and disease. Plantations are also at risk of loss from wildfire due to their contiguous structure and fuel levels. They are providing only poor to marginal habitat for the majority of Forest Service Sensitive or Federally-listed species on the Forest.

Project Location

The project area lies between two communities at risk, Hayfork and Hyampom, CA…..categorized as Intermix Community in the Federal Register: Volume 66 Number 3, January 04, 2001.

The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the Intermix ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of

intermix community emphasizes a population density of between 28-250 people per square mile.

Trinity County Collaborative Group

In 2012 with support from numerous local partners, the Trinity County Board of Supervisors created a collaborative group to work on natural resource management issues. In early 2013, the Secretary of Agriculture, Tom Vilsack, and a team from USDA visited Trinity County to discuss the local situation and offer support from the national level. Since the USDA visit, and after a series of exploratory conversations with interested partners about current issues, a robust collaborative group has coalesced.

The Collaborative would like to increase the amount of active management on National Forest System (NFS) lands in Trinity County. Their areas of agreement focus on forest conditions and management actions that impact humans and communities the most. Outside of supporting direct community wildfire protection, for which the Trinity County Fire Safe Council has developed and implemented a Community Wildfire Protection Plan (signed 2017), the Collaborative has developed support for treating fuels along high-use roads as well as adjacent to and within plantations, in order to improve forest health/habitat quality, reduce fuels, improve fire suppression capability through safe ingress/egress, and improve human safety. The Collaborative believes that all of the major roads within the County transportation system (federal, state, local, private) should be treated over time. In order to develop the ability to treat that large of a landscape, a pilot project is necessary to understand the constraints, opportunities, and tradeoffs associated with the Collaborative's internal agreements. Resource protection issues, local economic capability, and the processes and mechanisms for working with federal agencies will be part of the learning process.

Purpose and Need for Action

The need for the project can be described by two sets of goals. The first set of goals is to create safer ingress/egress for the local communities, improve forest health/habitat quality, reduce fuels, improve human safety, provide resilient plantations that can withstand insect and disease as well as wildfire, and create local economic opportunities. The second set of goals is focused on developing and implementing a pilot project that tests the three priorities of the Trinity County Collaborative: "Social Acceptance, Ecological Function, and Economic Sustainability." By evaluating project outcomes across these three priorities, the Shasta-Trinity National Forest (Forest) plans to work with the Collaborative, other interested publics, and Tribes to use what is learned while planning and implementing the pilot project to develop a subsequent County-wide strategy.

Social Need:

Reduce hazardous fuel loading in strategically located roads and plantations in high-risk areas to enhance defensibility, ingress and egress between the communities of Hyampom and Hayfork.

- *Protect and maintain significant investments the Forest Service has made in plantations and roads.*

There is a need for protection of investments the Forest Service has made in planting trees post-harvest and post-fire (plantations) and in the road system that access the project area. By reducing the stocking level of these plantations and creating a buffer between natural stands and plantations, the opportunity for these investments to mature and contribute to mature forest habitat will increase the odds of reaching the Forest's goals of ecosystem restoration at a larger scale.

Ecological Need:

- *Restore ecological resilience within plantations and strategic road buffers across land allocations within the project area.*

The desired conditions within plantations include healthy and more structurally diverse stands including openings, with reduced stand densities that allow for individual tree health and vigor to more quickly achieve late successional characteristics. Stand conditions would allow for safe reintroduction of fire, where appropriate, and would be more resilient to wildfire and endemic levels of disease and insect activity.

Economic Need:

- *Provide biomass utilization and forest commodities in the form of timber, post and pole, fuelwood/firewood, or wood chips where economical.*

Pilot/Learning Need:

- *Gain a strong understanding of options and tradeoffs in balancing and integrating Trinity Collaborative agreements and priorities identified in the Shasta-Trinity National Forest Land and Resource Management Plan (Forest Plan) direction and T&E species protections through project planning (pre-NEPA and NEPA), design and implementation.*

Management Direction

Shasta-Trinity National Forest Land and Resource Management Plan

The project area falls within the Indian Valley/Rattlesnake Management Area and contains Adaptive Management Area (AMA), Matrix, Riparian Reserve, and Late Successional Reserve land allocations. The Butter Creek watershed portion of the project occurs within the South Fork Trinity River Key Watershed.

The Proposed Action and alternatives are guided by the Land and Resource Management Plan (LRMP, Forest Plan). The Forest Plan provides programmatic management direction for site-specific projects through Goals, Standards and Guidelines which apply to all land allocations. Goals, Standards and Guidelines that apply include:

Goals

- *Manage the Forest's transportation system to facilitate resource management activities, protect wildlife, meet water quality objectives and provide recreational access (page 4-4).*
- *Implement practices designed to maintain or improve the health and vigor of timber stands, consistent with the ecosystem needs of other resources (page 4-5).*
- *Provide a sustained yield of timber and other wood products to help support the economic structure of local communities and to supply regional and national needs (page 4-5).*
- *Restore fire to its natural role in the ecosystem (page 4-4).*
- *Maintain water quality to meet or exceed applicable standards and guidelines (page 4-6).*

Standard and Guidelines

- *Retain roads on the Forest Service transportation system that will be needed for future activities such as forest health projects, timber management, fire protection, recreation management, and wildlife management (page 4-17).*
- *Perform road maintenance activities to meet a variety of management objectives…Schedule road maintenance activities according to the following priorities: (1) to provide for user safety; (2) to meet contractual and legal obligations; (3) to protect natural resources; and (4) to provide an efficient transportation system (page 4-16 and 4-17).*
- *Activity fuels[1] that remain after meeting wildlife, riparian, soil, and other environmental needs will be considered surplus and a potential fire hazard (page 4-17).*
- *Natural fuels[2] will be treated in the following order of priority: (1) public safety; (2) high investment situations (structural improvements, powerlines, plantations, etc.); (3) known high fire occurrence areas; and (4) coordinated resource benefits… (page 4-18).*
- *Plan and implement fuel treatments emphasizing those treatments that will replicate fire's natural role in the ecosystems (page 4-18).*
- *Analyze each land disturbing project for its effect on the appropriate 2nd or 3rd order watershed to prevent excessive cumulative impacts on stream channel condition and water quality (page 4-25).*
- *Implement Best Management Practices (BMPs) for protection or improvement of water quality for applicable management activities (page 4-25).*

[1] Those fuels created by the proposed treatments.
[2] Existing fuels already on the landscape prior to proposed treatments.

- *Implement Forest Soil Quality Standards and the Forest supplement of the Regional BMPs for areas identified as having highly erodible soils (page 4-25).*
- *Forest Soil Quality Standards, in relation to ground cover, soil organic matter, and soil porosity will be used to protect soil productivity (page 4-25).*
- *Give full recognition to the tendency for erosion, mass land movement, and severe watershed damage potential when implementing vegetation management and related land management activities (page 4-25).*
- *Assess potential impacts of vegetation management, road construction, and related activities on slope stability and watershed condition for areas identified as moderately or highly unstable (page 4-25).*
- *Timber stand improvement projects will emphasize maintaining or improving growth, and healthy, vigorous trees, through release and thinning (page 4-27).*
- *Use commercial thinning to maintain or improve tree health and vigor and to provide a marketable supply of wood products (page 4-27).*
- *Survey and evaluate habitat for Threatened, Endangered, and Sensitive (TE&S) species at the project level in coordination with U.S. Fish and Wildlife Service (page 4-30).*

Land Allocations

Land allocations that treatments are proposed to include:

- *Late Successional Reserves,*
- *Matrix,*
- *Adaptive Management Areas,*
- *Riparian Reserve, and*
- *Administratively Withdrawn (Unroaded Non-motorized Recreation and Limited Roaded Motorized Recreation).”*

See the Project EA and LRMP for additional elaboration on these land allocation categories, including the following:

Riparian Reserves

Riparian Reserves are to maintain and restore the distribution, diversity and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted. Prescriptions within Riparian Reserves are also to be consistent with the other eight Aquatic Conservation Strategy Objectives for riparian health maintenance and enhancement (Forest Plan 4-53).

The Riparian Reserve designation overlays the other land allocations including LSR and Matrix, and generally are designated within 300 feet of both sides of the high water

levels on perennial fish-bearing streams or 150 feet of both sides of high levels for perennial non-fish bearing streams and 100 feet for intermittent/ephemeral streams that display annual scour. Direction for management of Riparian Reserves is found in the Forest Plan (pages 4-53 through 4-60) and the Northwest Forest Plan ROD (pages C30 through C38). Management activities may occur in Riparian Reserves when they are in support of or do not adversely affect maintenance of riparian-dependent resources (i.e. fish, wildlife and water)".

Proposed Action and Alternatives

As per the Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (AP, 2004), the fish biological assessment guide used by this Forest: "A Project Element (PE) is a discrete activity which is a subset of the project under consultation. Examples for a timber sale might include road construction, landing construction, falling and yarding, timber haul, and site preparation". Based on the details of the Proposed Action described in the Project Environmental Assessment, the proposed action can be divided into the following PEs and sub-activities.

PROJECT ELEMENTS

1. Thinning activities

Thinning within and adjacent to plantations along the two roads comprise three management activities: thin existing plantations, thin a buffer around treated plantations, and thin a buffer along the two roads in the project area.

- Hand thinning is the felling of trees in the plantations with a chainsaw. Trees would then be cut into smaller pieces. If resulting slash is deeper than 16 inches, then additional fuel treatments will occur as described below.
- Pruning lower branches on remaining trees to a canopy base height of eight feet removes ladder fuels, reducing the chance of crown fires.
- Utilization of thinned material (slash/tree tops/logs) whenever possible. This can include commercial or personal firewood. This treatment reduces flame lengths, rates of spread, continuity of fuels and the amount of smoke production from pile burning.
- Release is the cutting of competing vegetation with conifer trees.
- Whole tree yarding is the pulling of the whole cut tree to the landing by machine (or cable system) to be processed on the landing site. This will reduce surface fuels in the unit lowering flame lengths and rates of spread.
- Mastication pulverizes or chops standing trees and logs into small particles. This treatment can include mowing, mulching, or chipping. Mastication reduces fuel height which reduces flame length, rates of spread, and crown fire initiation.

2. Fuels reduction

- Hand piling slash[3] will reduce surface fuels across the unit reducing flame lengths and rates of spread (piles vary in size but generally won't exceed 1/32nd of an acre).
- Machine piling slash will reduce surface fuels across the unit reducing flame lengths and rates of spread (piles range in size but are generally no greater than 1/16th of an acre).

Reduce fuel loading to 10-20 tons/acre (consistent with Forest Plan Management Prescriptions) including brush and down logs.

3. Prescribed fire

- Pile burning* will reduce only surface fuels that are piled. This treatment will lower flame lengths and rates of spread, reduce crown fire initiation, and lower active crown fire potential.
- Jackpot burning* is a burning method used to reduce fire hazard in areas where heavy intermittent fuel concentrations exist, but are not continuous enough for a broadcast fire to carry through the fuels, and where piling would be impractical. This burning is normally carried out when larger fuel is dry enough to burn, but fine fuel is too wet or too discontinuous to sustain fire.
- Broadcast burning* is a burning method used where continuous fuel concentrations exist. This is the most effective treatment for reducing surface fuel loading. This treatment will lower flame lengths and rates of spread, reduce crown fire initiation, and lower active crown fire potential.

4. Road and Landing Maintenance/Construction

Road maintenance/reconstruction as well as landing and access ramp construction or utilization will occur as necessary. See further information below under the description of alternatives.

5. Legacy Sediment Site Treatments

The following sites will be proposed for treatment if any of the action alternatives are chosen. Sites proposed for remediation include 32 failing stream crossing sites along the Indian Valley (2N10) and Butter Meadows (3N08) roads and seven crossings along road 2N18F which is a closed Level 1 road. The quantity of fine-grained road fill material proposed for treatment which would be prevented from reaching then transported down flowing stream courses is approximately 64,000 cubic yards. See the Pilot Project Legacy Sediment Site Report (2019) and accompanying Stream Crossing Upgrade Guide.

Based on the issues identified through public comment on the proposed action, the Forest initially developed four additional alternative proposals that achieve the purpose

[3] Vegetation debris consisting of both existing fuels and fuels resulting from project implementation.

and need differently than the proposed action. In addition, the no action alternative within the Project EA is a continuance of the current condition. All of the original alternatives will be discussed below.

No Action – Alternative 1

Under this alternative, no treatments would take place in conjunction with this project. The surrounding area's environmental baseline will persist and evolve the same as if this project was never proposed.

The following information about Alternatives 2-6 is paraphrased from the current or earlier drafts of the Pilot Project EA.

Proposed Action - Alternative 2

The proposed Pilot Project area is located along two strategic roads within the Hayfork Ranger District of the South Fork Management Unit on the Shasta-Trinity National Forest (see project map in the EA and in Appendix D) in order to create a roadside safety corridor. The proposed action would cover 4,025 acres focusing on thinning treatments along the Indian Valley (2N10) and Butter Meadows (3N08) roads, as well as within and adjacent to plantations. As stated above, the goals are to contribute towards ecological and economic sustainability and social benefit along approximately 40 miles of roads open to the public.

Thinning

Treatments would include utilization of any material as appropriate, to achieve a long-term ecological condition that can withstand insect and disease outbreaks and wildfire. Treatment prescriptions would match land management allocation objectives of the LRMP, while incorporating resource protection measures (RPMs) and BMPs to minimize significant impacts. The proposed action includes three related management activities:

1) The roadside and plantation thinning and fuels reduction buffer (roadside safety corridor) would be 300 feet total width (not including the width of the system road, shoulder to shoulder) and would be adjacent to the Indian Valley (2N10) and Butter Meadows (3N08) roads, and around the plantations that intersect the roadside buffer. Width of the buffer on either side of the road could vary but would not exceed 300 feet total width; e.g. if conditions promote a wider treatment on the uphill side, the uphill side may be treated up to 275 feet from the road and the downhill side would be treated 25 feet from the road. The minimum treatment area along either side of the road would be 25 feet. Fuels reduction treatment could occur within the entire buffer, where warranted. Where treatments result in utilizable material, products could be offered.
    a) Thin existing stands to retain the best, healthiest trees that have a high canopy capacity (those with the strongest crown to bole ratio, have the highest needle or leaf cover and provide the most shade to the forest floor), capable of maintaining those objectives for a long period of time within the buffer area.
        i) Designate for removal suppressed, intermediate, and codominant conifer trees that compete with the best, healthiest trees that have a high canopy

capacity, based on the thinning objective by stand type. This is to reduce continuity of vegetation, and competition for available site resources.

ii) Trees that provide valuable wildlife structures may be considered as part of the shade retention objective.

iii) Outside the dripline of larger trees designated for retention, retain vigorous clumps of healthy intermediate mixed conifer trees to provide for more complex stand diversity and a source of future mature trees.

iv) Retain hardwood trees. Culture hardwood clumps to one to three dominant stems where appropriate.

See Tables 1 and 2 below for a tabular representation of the preferred alternative activities.

Table 1: Stand Type Thinning Objectives (Preferred Alternative, from the Project EA):

Stand Type	Thinning Objective	Retention Preference
Upland Mixed Conifer Stands (UMCS)	D + 6 Space trees less than 16 inches 17 to 22 feet from one another. See Appendix A (EA) for Spacing over 16 inches. Target Residual TPA determined by the diameter of leave trees (range from approximately 28 to 105 trees per acre for stands with a QMD less than 35 inches)	• all uninfected (white pine blister rust (WPBR)) sugar pine • vigorous Douglas-fir • all uninfected (mistletoe) ponderosa/Jeffrey pine • incense cedar • white fir
Upland Pine Stands (UPS)	D + 10 Space trees less than 16 inches 21 to 26 feet from one another. See Appendix A (EA) for Spacing over 16 inches. Target Residual TPA determined by the diameter of leave trees (range from approximately 22 to 70 trees per acre for stands with a QMD less than 35 inches)	• all uninfected (WPBR) sugar pine • all uninfected (mistletoe) ponderosa/Jeffrey pine • vigorous Douglas-fir • incense cedar • white fir
High Value Wildlife Stands (HVWS)	D + 4 Space trees less than 16 inches 15 to 20 feet from one another. Maintain 10 clusters (3 to 5 trees) per acre outside of the dripline of dominant and	• all uninfected (WPBR) sugar pine • vigorous Douglas-fir • all uninfected (mistletoe) ponderosa/Jeffrey pine • incense cedar

Stand Type	Thinning Objective	Retention Preference
	codominant trees. These clusters would be considered an individual tree of 16 inches for spacing (15 to 20 feet). See Appendix A (EA) for Spacing over 16 inches. Target Residual TPA determined by the diameter of leave trees (range from approximately 25 to 109 trees per acre for stands with a QMD less than 35 inches)	• white fir
Riparian Reserve Stands	Understory treatment Remove all conifer trees less than 8 inches located within the dripline of a larger trees. Space trees less than 8 inches 15 to 20 feet from one another.	• Retain all true-riparian vegetation
Oak Woodlands	Thin multi-stemmed oaks down to 1 to 3 stems, depending on size. Remove all conifers from oak dominated areas, except dominant and predominant trees (these are generally exceeding 24 inches in diameter).	• Retain all oak individuals. Culturing and pruning of oaks is permitted.
Brush Field	Thin brush fields to retain clumps of brush (or individual shrubs) up to 10 feet in diameter spaced 20 - 30 feet apart. Shrub/clump spacing distance will increase with slope. Remove all brush from under the drip line of leave trees. Leave trees within the brush field will be pruned to a maximum of 8’ or half of the live crown. Hardwoods less than 6’ tall will be considered brush and may be thinned accordingly. Residual hardwoods may be cultured to 1 – 3 dominant	• Retain all dominant and predominant trees (these are generally exceeding 24 inches in diameter).

Stand Type	Thinning Objective	Retention Preference
	stems and pruned up to 8' or half of the live crown. Conifers up to 8 inches dbh may be removed, and clumps of conifers may be thinned to 15 to 20 feet from one another.	
Plantations	Thin from below in plantation stands 24 to 56 years old, retaining an average range of 60 to 200 trees per acre Pine dominated stands would be thinned to an average density of 100 trees per acre (general average spacing of 21 feet by 21 feet). Mixed conifer stands would be thinned to an average density of 135 trees per acre (general average spacing of 18 feet by 18 feet).	• The legacy trees[4] would not be removed unless they pose a safety threat or are diseased. If cut, they would be left on site as large woody debris (logs). • All healthy dominant and co-dominant hardwood species would be retained and would count in spacing criteria. When hardwoods have multiple stems, the dominant two to three stems would be retained.

(**D+** is a silvicultural prescription that uses the diameter of the tree in inches and takes that same number in feet plus the additional spacing to meet the objectives.)

Table 2: Plantation Prescriptions (Preferred Alternative, from the Project EA):

	All Units outside of Late-Successional Reserve and Riparian Reserves	Units in Late-Successional Reserve	Units in Riparian Reserves
Tree Density			
Pine Stands	Average 100 trees/acre with varied spacing	Average 100 trees/acres with substantially varied spacing, and areas of heavy canopy cover[5]	Average 135 trees/acre with varied spacing
Mixed Conifer Stands	Average 135 trees/acre with varied spacing	Average 135 trees/ac with substantially varied spacing, and	Average 200 trees/ac with varied spacing

[4] Mature or old-growth tree that is retained on a site after the original harvest or natural disturbance to provide a biological legacy.

[5] Canopy cover is defined as the ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area - synonym canopy cover.

		maintaining areas of heavy canopy cover	
All stands greater than 12 inches dbh	Depending on dbh, average 60 to 100 trees/acre	Depending on dbh, average 60 to 100 trees/acre	Depending on species, average 135 to 200 trees/acre
Priority Leave Trees			
Conifer	Priority for conifer retention is: sugar pine, Douglas-fir, ponderosa and Jeffrey pine, incense cedar, and white fir that are dominant, co-dominant, or intermediate. Species diversity will be encouraged.	Priority for conifer retention is: sugar pine, Douglas-fir, incense cedar, white fir and ponderosa/Jeffrey pine while ensuring species diversity. Provide for vertical diversity utilizing a mixture of conifer, hardwood and shrub species and retention or culturing of "decadent" trees.	Priority for conifer retention is: sugar pine, Douglas-fir, ponderosa and Jeffrey pine, incense cedar, and white fir that are dominant, co-dominant, or intermediate. Species diversity will be encouraged.
Hardwood	Retain all dominant and co-dominant hardwoods.	Retain all dominant and co-dominant hardwoods.	Retain all dominant, co-dominant and healthy intermediate class hardwoods.

b) Reduce fuel loading to 10-20 tons/acre (consistent with Forest Plan Management Prescriptions) including brush and down logs.

   i) The intent is to have less fuel loading along the road and the treatment would feather into the natural stand with more fuel loading away from the road.[6]

c) Where necessary, create a control line on the outside edge of treatment areas where necessary to maintain fuel reductions with prescribed fire. The control line may be constructed by hand or dozer as appropriate for containment and site impacts.

d) Retain all snags >15" dbh (including cull trees) unless the snag could be considered a hazard tree. A hazard tree, within striking distance of the

[6] Surface fuels includes all fuels (live and dead) that could influence surface flame length and/or contribute to crown fire initiation: Leaf/needle litter, dead and down, live brush, and small trees up to 8 inches dbh. This includes tree limbs up to a height of 8 feet.

road and likely to fall in the direction of the road given the topography and natural lean of the tree, would be removed. Hazard trees that are felled outside the treatment buffer would be left onsite.

e) Where appropriate, stumps of freshly cut conifers over 14-inches in diameter would be treated with an EPA-registered borate compound to prevent spread of Heterobasidion root disease.

2) Young plantations that were not included in the Westside Plantations Project or Middle Hayfork Project are included in this project.

a) Thin trees to an average 20-foot spacing (110 trees per acre, TPA). In addition, reduce surface fuels by methods listed below.

b) Legacy sediment sources identified in the project area would be restored.

Fuels Treatment Methods

Reduce fuel loading to 10-20 tons/acre (consistent with Forest Plan Management Prescriptions) including brush and downed logs.

Within all vegetation treatment areas, including all treated plantations, the following methods may be used to reduce the fuel loading:

- Hand felling, which cuts down trees and/or brush using hand tools such as a chainsaw.
- Mastication, which pulverizes or chops standing trees and logs into small particles. This treatment can include mowing, mulching, or chipping.
- Chipping, which pulverizes or chops trees, brush, and logs into small particles, redistributing surface fuels.
- Pruning, which removes lower limbs up to eight feet from the ground or half the live crown.
- Hand piling slash, which concentrates slash and surface fuels in small piles.
- Machine piling slash, which utilizes equipment to pile slash and surface fuels into larger piles.
- Pile burning, which is the prescribed ignition of created piles.
- Jackpot burning, which is a burning method used to reduce heavy intermittent fuel concentrations, where fuels are not continuous enough to carry a broadcast fire.
- Broadcast burning, which is a burning method used where heavy continuous fuel concentrations exist.

Activity fuels that remain after meeting wildlife, riparian, soil, and other environmental needs will be considered surplus and a potential fire hazard. The amount and method of disposal will be determined in the ecosystem analysis.

The proposed project is expected to demonstrate the range of forest stands, terrain, planning options and challenges, resource impacts, and economic hurdles that will be expected across the larger Trinity County landscape.

Maintenance - Roads, Thinning Units and Fuels Treatments

Road maintenance/reconstruction as well as landing and access ramp construction or utilization would occur as necessary.

a. Access ramps (less than 100 feet in length) may be utilized to access existing or newly constructed landings. Ramps will be decommissioned following use.

The treatments would be maintained over time to retain the fuels reduction benefits, improve establishment of planted trees, and guide the development of the forest toward desired conditions. The maintenance treatments would occur over the same areas where initial treatments are proposed.

Roadside safety corridors are characterized by little canopy closure and discontinuous ladder fuels and surface fuels. The roadside buffers would need to be maintained over time. It is recommended that these areas be monitored every 3-7 years to determine if it still meets the fire behavior objectives. When the area begins to exceed the fire behavior objectives the following treatments would need to be implemented either alone or in combination: broadcast burning, cut live and dead brush, reduce ladder fuels 8 inches DBH or less under drip lines of remaining trees, machine/hand pile, and pile burning.

Within plantations, the primary goal of maintenance would be the growth of planted trees as well as developing resilience to fire, disease, and insects. A release for growth would occur approximately 10 years after treatments and would thin conifers if stand density was higher than expected (125 to 200 trees to the acre) due to competing vegetation. When the plantations begin to exceed the fire behavior objectives the following treatments would be implemented where appropriate either alone or in combination: broadcast burning, cut brush and ladder fuels 8 inches dbh or less under drip lines of remaining trees, machine/hand pile, and pile burning.

Legacy Sediment Sites

Sites identified in the Project Physical Science Report and Legacy Sediment Site Report will be addressed as described in those reports.

Monitoring

Monitoring will rely on plots, primarily photo series and/or planar intercept, every 3-7 years to assess and quantify fuel loading and profiles in order to maintain the fire behavior objectives listed above.

Best Management Practices monitoring would take place as appropriate based on the schedule of implementation.

Working with the Trinity County Collaborative Group, the design and implementation of the treatments would be monitored to assess the effectiveness of the proposal and the opportunities to adapt future proposals.

Alternative 3

This alternative would occur within the same boundaries and have the same treatments as Alternative 2 however there would be no machine piling or mastication in treated units, no mechanized equipment used in the RRs, and no control line preparation using dozers. The same number of acres, 4,025, would be treated as in the Proposed Action alternative 2. Note this change from Tables 1 and 2 above and see the Alternatives Comparison Table in Appendix B of the Project EA.

Alternative 4

This alternative would occur within the same boundaries as Alternative 2 and the same number of acres – 4,025 - treated, however there will be an 18 inch maximum diameter cutting limit in Late Successional Reserve (LSR), RR, and natural stands. New landing construction will be minimized in LSR and spotted owl Critical Habitat. Snags greater than 18 inches will be retained in LSR and RR when not deemed a hazard to roads, landings, or operations. The prescriptions in the buffers along roads and plantations for this alternative are different than Alternative 2 in order to meet the desired conditions established in the purpose and need. The prescription in the buffers along roads and plantations will be a thin from below up to the 18 inch diameter limit. Note this change in Table 1 above and the Alternatives Comparison Table in Appendix B of the Project EA. The prescriptions for plantations will be the same as described in Alternative 2.

Alternative 5

This alternative would employ a consistent 100 foot total width buffer along the roads and around plantations, and have the same treatments as Alternative 2. The roadside buffer would be 50 feet on either side of the road. The Project treatment area would decrease to 2,270 acres from 4,025 acres.

Alternative five was later dismissed from consideration because the reduced acreage proposed for treatment was not adequate to simply ensure safe ingress/egress for the local public along the two treatment roads.

Alternative 6

This alternative would occur within the same locations and have the same treatments as Alternative 2, however there would be no botany avoidance areas. The avoidance areas total 269 acres in the other alternatives.

Alternative six was eventually eliminated from analysis because ignoring botany avoidance areas is not consistent with the LRMP along with other requirements to protect rare plants.

Alternative 7

Only plantations would be treated in this alternative yielding a Project treatment of 1,239 total acres.

Alternative seven was dismissed because fuels along the two main roads would not be treated, as well as fuels surrounding the plantations.

Environmental Baseline

Baseline conditions tabularized below were analyzed utilizing Trinity River Fish Management Unit Stream Condition Inventory data, Rapid Fish Assessments and Temperature Monitoring Inventories and hydrographs.

Butter Creek

The following is found in the Physical Science Report: "Stream temperatures in lower Butter Creek are abnormally low relative to the drainage area (Asarian, 2016). Butter Creek is accessible to anadromous fish and has previous documentation of coho salmon presence. Stream temperature data is available for Butter Creek about 0.1 mile above the mouth, and at a second location about 0.6 mile further upstream. Despite the short distance between them, the upstream site appears to be substantially cooler than the downstream site, which can only be partially explained by the lack of data at the upstream site during the warmest years. Stream temperatures recorded on Butter Creek range from a low MWMT of 16.7 °C in 2011, and a high MWMT of 20.9 °C in 1990 and 1991".

The upstream limit for adult anadromous fish migration on Butter Creek is about two miles upstream from the confluence of Butter Creek with the South Fork Trinity River where a permanent natural series of boulder and bedrock waterfalls and cascades occur (Brock, personal observation). This anadromous fish upstream migration limit is at least two miles downstream from the Project treatment boundary areas. There is no feasible means by which Project activities could impact any anadromous fishes or anadromous fish stream habitat in lower Butter Creek. See the baseline condition for Butter Creek in Table 3 below. The habitat descriptors, or 'Indicators' used in Table 3 (and 4 and 5 below) are explained in Appendix A.

Indian Valley Creek is a tributary of Butter Creek and possesses no anadromous fish habitat by being located upstream from the Butter Creek anadromous fish barrier. It possesses MIS rainbow trout.

The USFS rapid assessment of Butter Creek noted in 2013 that there was suspected marijuana cultivation. The stream and tributaries are also close to roads. The USFS Fishery Assessment and Stream Condition Inventory (USFS, 2007)) documented fully functioning conditions for water temperature, shade, large woody debris (LWD) and sediment conditions. Pool frequency is functioning but pool quality could be improved.

The Butter Creek Watershed Analysis (WA, 1994) cited reports of adult summer steelhead (an MIS species) near the Butter Creek and South Fork Trinity River confluence. Winter steelhead (MIS and Sensitive species), however are more commonly found in that area. References in the 1994 Butter Creek WA documented good densities of age 0+ steelhead. The WA suggested that high stream gradients and high winter flows may be limiting older steelhead juveniles age 1+ and 2+ and adult steelhead from fully utilizing the accessible stream habitat of the lower two miles.

Boulders and other coarse materials were reported as the predominant substrate in earlier reports on Butter Creek. Substrate conditions appear to have improved and the 2007 Stream Condition Inventory documented 62 percent gravel with 0 percent pool tail fines. Stream bank stability was functioning at risk. Chinook salmon redds have been identified in the South Fork Trinity River near Butter Creek by the USFS fish staff between October 1 and October 15 during one or more years.

Hayfork Creek

Hayfork Creek is not within the Project action area but is the major tributary to the South Fork Trinity River that several project-related smaller tributaries described below drain into. See the Project Map in Appendix D and in the Project EA. As stated in the Lower Hayfork Creek watershed analysis, 1996: "Habitat conditions in lower Hayfork Creek are poor and fish abundance is quite low". A water temperature 'mask' or curtain is evident in the lowermost few miles of Hayfork Creek as designated by the National Marine Fisheries Service (2014). Water temperatures have been measured as high as 85 degrees in the lower portion of the creek closest to the Project area (WA 1996). As stated in the WA: "Current numbers (of coho salmon) in the South Fork Trinity are very low and no record of coho salmon presence in Hayfork Creek exists".

The following paragraphs are found in or paraphrased from the STNF's Dubakella Plantations Insect and Disease Project Fish BA/BE.

SONCC coho salmon have not been observed in Hayfork Creek upstream from the lower portion of the stream near the tributary of Corral Creek since the fish were listed as per the ESA in 1997 and the critical habitat designated in 1999. The map illustrated as Figure 40-1 on page 40-3 of the 'Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon' (2014) illustrates what is called a 'temperature mask', or an area that is inherently too warm for rearing coho salmon, covering the lowermost few miles of Hayfork Creek that drains directly into the South Fork Trinity River and another temperature 'curtain' over more than the upper half of the entire Hayfork Creek drainage area. The portion of Hayfork Creek closest to the Project area is therefore currently inhospitable for SONCC coho salmon and has been for probably twenty or more years.

To emphasize the awareness and duration of this problem, the following is found in the 1998 Upper Hayfork Creek Watershed Analysis: "Hayfork Creek….in the past, may have supported coho salmon". The 2014 Recovery Plan concludes that the 1955 and 1964 floods in the South Fork Trinity River basin, including Hayfork Creek, led to the demise of coho salmon and the beginning of the downward spiral for all the remaining anadromous salmonid fishes addressed in this report. Both Hayfork Creek and the South Fork Trinity River flow generally from south to north, leaving their water surfaces largely exposed to mid-day sunlight for several hours daily in spring, summer and fall. No doubt this solar exposure falling upon widened, shallower stream surfaces post-flooding is partially responsible for the temperature mask designation, combined with serious levels of water diversions and occasional droughts which decrease natural quantities of flow volume. Even climate change is being cited as an issue (NMFS 2014).

A report entitled “South Fork Trinity River and Hayfork Creek Sediment Total Maximum Daily Loads”, US EPA 1998, states that “Temperatures in the lower South Fork and selected tributaries, particularly the lower portion of Hayfork Creek, have been implicated as being too high to fully support aquatic habitat. Existing information suggests that high temperatures could result from: natural conditions (i.e., the lower South Fork was always relatively warm in the summer, even prior to active land management in the basin), water diversions (particularly in Hayfork Creek), loss of riparian vegetation in selected locations, and excess sedimentation that resulted in channel widening and decreased water depths”.

A Forest Service document entitled “Middle Hayfork Creek and Salt Creek Watershed Analysis” (year 2000) declined to analyze coho salmon in the middle portion of Hayfork Creek because: *“*Coho salmon inhabited the watershed in the past but are now thought to be extirpated”.

It is frustrating that Hayfork Creek has as many aquatic habitat problems that it now has because it is considered largely immune to the devastation of the 1955 and 1964 floods that caused serious damage to the main South Fork Trinity River channel. A more stable natural geology for Hayfork Creek promoted it to be more resilient to aquatic damage from those two storms. The natural channel boosts more rapid transport of flood-borne material rather than deposition of it (US EPA 1998).

It is also discouraging that the extirpation of coho salmon in Hayfork Creek apparently eliminated a unique run of coho salmon different than that occurring in shorter true coastal streams of the ESU and in the lower Klamath or lower Trinity Rivers (NMFS 2014). In order for a coho salmon to spawn and rear successfully in the upper half of Hayfork Creek (but including the general Project area), the adults would have had to arrive in lower Hayfork Creek in September or October to continue their lengthy migration upstream in Hayfork Creek vs the November or December arrivals of the bulk of the current run (NMFS 2014).

To sum, the following line found in the Federal Register (Vol 64, Number 86, May 5, 1999) first designating Critical Habitat for SONCC coho salmon: “While unoccupied streams are excluded from critical habitat….” may not have been intended to specifically apply to Hayfork Creek at the time of such designation, but it certainly describes the dysfunctional unoccupied habitat of today occurring closest to the Project area within the inhospitable ‘temperature mask’.

See Table 4 below, an environmental baseline summary of Hayfork Creek. The sources of information for this table are depicted in the References Section.

Rusch Creek

Rusch Creek is a tributary of Hayfork Creek draining into Hayfork Creek from the South, or Project side. Rusch Creek is accessible to anadromous fish in the downstream portion. The water temperatures for Rusch Creek have ranged from 16.1 °C in 2011 to 19.2 °C in 2014 (Asarian, 2016). The stream has a generally greater upstream gradient not very accommodating for adult anadromous fish upstream migration, at least for any sporadic salmon (Lower Hayfork WA 1996). The definitive upstream barrier to adult

anadromous fish migration resides in the northern edge of section 17, Township 31 North, Range 8 East, and is comprised of a steep (43%) gradient reach of boulder falls and cascades (USBR 1991). The Pilot Project boundary does not extend downstream to the anadromous fish portion of Rusch Creek. Proposed activities are limited to specific treatment areas upstream from the anadromous fish accessible lower reach. It appears based on gradient that Rusch Creek would not be conducive to having a regular coho salmon run residing in it even if coho salmon were commonly found in Hayfork Creek due to the overall steeper stream gradient that exists downstream from the true fish barrier. The general stream gradient in the lower reaches below the permanent barrier ranges from 6-19% (USBR 1991), too steep for coho salmon migration. Excessive sedimentation in Rusch Creek was an overall problem in 1991 (USBR 1991) but appears to have improved since then (Table 4).

Winter steelhead and resident rainbow trout are found in Rusch Creek. The USFS 2012 Stream Condition Inventory (SCI) documented properly functioning conditions for temperature, shade, and large woody debris. Rusch Creek is also properly functioning for pool tail fines, streambank and sediment conditions. Pool frequency is properly functioning but pool quality could be improved.

See the baseline condition for Rusch Creek in Table 5 below.

West Fork Tule Creek

West Fork Tule Creek is a tributary to Tule Creek which is a tributary to Hayfork Creek near the town of Hayfork. West Fork Tule Creek harbors anadromous fish habitat for a couple miles upstream from the confluence with Tule Creek, but the potentially migrating fish must first be subjected to the barrier effects of the inhospitable temperature curtain or mask in lower Hayfork Creek extending several miles upstream toward the confluence with Tule Creek. There is no evidence through survey observations that SONCC coho salmon have entered West Fork Tule Creek in perhaps many years, therefore categorizing the CH as unoccupied. No stream temperature data is available (Asarian, 2016). Anadromous steelhead can migrate up to the boundary between sections 17 and 18 before reaching unsuitable migration habitat. A portion of the Project treatment area lies not far upstream via slope distance from a reach of West Tule Creek anadromous fish habitat. The West Fork Tule Creek environmental baseline checklist presented below as Table 6 captures a stream survey performed in 2003.

As per the Tule Creek environmental baseline table below, the relevant habitat indicators that are considered to be less than ideal (At Risk column) are water temperature, LWD, pool quality, width/depth ratio, and disturbance history.

Proposed treatments along the eastern end of road 3N08 could conceivably impinge upon the outer riparian reserve of West Tule Creek. If the Project were executed poorly, the channel of West Tule Creek could be affected via sedimentation or turbidity because the edges of roadside or plantation buffer treatments appear to get within 300 feet of West Tule Creek in section 20 (see Project map) which would probably be the RR boundary. See further discussion about this below.

Note that Water Quality is listed twice as a key resource element in Table 1 of the Physical Science Report with Sediment and Water Temperature as key Resource Indicators, similar to below.

The criteria used for the Tables below for the Butter, Hayfork, Rusch and Tule Creek Environmental Baselines are derived from Table 1 and Appendix A in the USDA/USDI/USDC 2004 Analytical Process document.

Table 3. Butter Creek Environmental Baseline

Indicators	Environmental Baseline		
	Properly functioning	**At risk**	**Not properly functioning**
Temperature	2015FS Stream Hydrography[1]		
Sediment	2007 FS SCI[2]		
Chemical Contamination	2013		
Physical Barrier	2007 FS SCI 2013 FS Assessment		
Substrate	2007 FS SCI 2013 Assessment		
LWD	2007 SCI 2013		
Pool Frequency	2007 FS SCI 2013		
Pool Quality		2013 Assessment	
Off-channel Habitat	N/A[4]	N/A[4]	N/A[4]
Refugia	2007 FS SCI, 2013		
W/D Ratio	2007 FS SCI		
Streambank Condition.		2007 FS SCI,	
Floodplain Cond.	2007 FS SCI 2013		
Flow / Hydrology			
Peak/Base Flow		CWE MODEL	

Indicators	Environmental Baseline		
Drainage Network Increase		2013 FS SCI	
Watershed Condition			
Road Density / Location		2013 FS SCI WA[5]	
Disturbance History		2013 FS SCI, WA Butter Cr[5]	
Riparian Reserves		2013 FS SCI, WA Butter Cr[5]	

[1]2013-2015 FS Stream hydrography – USDA Forest Service Stream Temperature Hydrograph Inventory.
Trinity River Management Unit, Weaverville, CA.

[2]FS 2007 Stream Condition Inventory (SCI) – USDA Forest Service Stream Condition Inventory. 2007.
Trinity River Management Unit, Weaverville CA.

[3] FS 2013Rapid Assessment– USDA Forest Service Stream Condition Inventory. 2013.
Trinity River Management Unit, Weaverville CA.

[4] N/A – generally not applicable to this channel type.

[5] Watershed Analysis (WA) Butter Creek 1994, Shasta Trinity National Forest.Hayfork Ranger District.

Table 4. Lower Hayfork Creek Environmental Baseline

		Environmental Baseline		
DIAGNOSTIC OR PATHWAY	**INDICATORS**	**PROP. FUNCT.**	**FUNCT. AT RISK**	**NOT PROP. FUNCT.**
HABITAT				
Water Quality:	Temperature		X	
	Suspended Sediment - Intergravel DO/Turbidity			X
	Chemical Contamination/ Nutrients		X	
Habitat Access:	Physical Barriers	X		

Habitat Elements:	Substrate Character and Embeddedness	X		
	Large Woody Debris			X
	Pool Frequency and Quality		X	
	Large Pools	X		
	Off-channel Habitat	N/A- not a significant component of this channel type		
	Refugia			X
Channel Condition & Dynamics:	Average Wetted Width/ Maximum Depth	X		
	Streambank Condition		X	
	Floodplain Connectivity			X
Flow/Hydrology:	Change in Peak/Base Flows			X
	Increase in Drainage Network			X
Watershed Conditions:	Road Density & Location			X
	Disturbance History	X		
	Riparian Reserves - Northwest Forest Plan			X
	Disturbance Regime			X
SPECIES AND HABITAT				
Species and Habitat:	Summary/Integration of all Species and Habitat Indicators		X	

*Information from the following sources was reviewed and helped inform the Table parameters:

[1]2013-2015 FS Stream hydrography – USDA Forest Service Stream Temperature Hydrograph Inventory.
Trinity River Management Unit, Weaverville, CA.
[2]FS 2007 Stream Condition Inventory (SCI) – USDA Forest Service Stream Condition Inventory. 2007.
Trinity River Management Unit, Weaverville CA.
[3] FS 2013 Rapid Assessment– USDA Forest Service Stream Condition Inventory. 2013.
Trinity River Management Unit, Weaverville CA.
[4] N/A – generally not applicable to this channel type.
[5] Watershed Analysis (WA) Butter Creek 1994, Shasta Trinity National Forest.Hayfork Ranger District.

Table 5. Rusch Creek Environmental Baseline

Indicators	Environmental Baseline		
	Properly functioning	At risk	Not properly functioning
Water Quality			
Temperature	2015 FS Stream Hydrography[1]		
Sediment	2012 FS SCI[2]		
Chemical Contamination	2012 FS SCI		
Habitat Access			
Physical Barrier	2012 FS SCI		
Habitat Elements			
Substrate	2012 FS SCI		
LWD	2007 FS SCI		
Pool Frequency	2007 FS SCI		
Pool Quality		2007 FS SCI	
Off-channel Habitat	N/A[3]	N/A[3]	N/A[3]

Indicators	Environmental Baseline		
Refugia	2007 FS SCI,		
Channel Condition & Dynamics			
W/D Ratio	2007 FS SCI		
Streambank Condition.		2007FS SCI,	
Floodplain Cond.	2007 FS SCI		
Flow / Hydrology			
Peak/Base Flow		2007 FS SCI	
Drainage Network Increase		2007 FS SCI	
Watershed Condition			
Road Density / Location		1996 WA[4] Lower Hayfork	
Disturbance History		2007 FS SCI,	
Riparian Reserves	2007 FS SCI, Rusch Creek		

[1]2013-2015 FS Stream hydrography – USDA Forest Service Stream Temperature Hydrograph Inventory.
Trinity River Management Unit, Weaverville, CA.
[2]FS 2012 Stream Condition Inventory (SCI) – USDA Forest Service Stream Condition Inventory.
Trinity River Management Unit, Weaverville CA.
[3] generally not applicable to this channel type
[4]. 1996 Lower Hayfork Creek Watershed Analysis, Shasta Trinity National Forest Analysis.

Table 6. Tule Creek Environmental Baseline at FS Road 31N31.

Pathway - Indicators	Environmental Baseline		
	Properly Functioning	At Risk	Not Properly Functioning
Water Quality			
Water Temperature		J. Lang	
Sediment	J. Lang		
Chemical Contaminants	J. Lang		

Habitat Access			
Physical Barrier	J. Lang		
Habitat Elements			
Substrate	J. Lang		
LWD		J. Lang	
Pool Frequency	J. Lang		
Pool Quality		J. Lang	
Off-channel Habitat		N/A	
Refugia	J. Lang		
Channel Cond. & Dynamics			
Width/Depth Ratio		J. Lang	
Streambank Condition	J. Lang		
Floodplain Condition	J. Lang		
Flow /Hydrology			
Peak/Base Flow	J. Lang		
Drainage Net Increase		J. Lang	
Watershed Condition			
Road Density/Location		J. Lang	
Disturbance History		J. Lang	
Riparian Reserves	J. Lang		

Existing Condition ERA

The Project's Physical Sciences Report (2019) lists the following table as an indication of the current land management disturbance status for the Project area. As stated in the Report: "The current equivalent roaded area caused from all past actions is shown in Table 4 (Table 7 below) for each of the hydrologic units in the project area. No hydrologic units are over the threshold of concern. The Butter Creek sub-watershed has a moderate disturbance level".

Table 7. Existing condition ERA for the hydrologic units in the project area.

Hydrologic Unit	ERA (Acres)	Risk Ratio (% of TOC)	Disturbance Level
5 6 7 8			
Lower Hayfork Creek	4659	20	Low
Grassy Flat - Miners Creek	818	15	Low
Lower Hayfork Creek Canyon	317	22	Low
1801021204050501	42	16	Low
1801021204050503	31	18	Low
Rusch Creek - Little Creek	1143	22	Low
Rusch Creek	296	22	Low
1801021204030401	97	35	Low
1801021204030402	92	28	Low
Tule Creek - Hayfork Creek	598	25	Low
Lower Tule Creek	392	27	Low
1801021204020203	100	25	Low
1801021204020204	67	15	Low
Upper Tule Creek	252	20	Low
1801021204020101	138	25	Low
1801021204020104	32	14	Low
Middle South Fork Trinity River	6404	37	Low
Butter Creek	1650	44	Moderate
Upper Indian Valley Creek	670	55	Moderate
1801021202040101	203	60	Moderate
1801021202040102	126	52	Moderate
1801021202040103	185	55	Moderate
1801021202040104	156	50	Moderate
Lower Indian Valley Creek	284	30	Low

			1801021202040201	144	34	Low
			1801021202040203	36	22	Low
		Butter Creek Meadows		697	45	Moderate
			1801021202040301	146	49	Moderate
			1801021202040302	226	68	Moderate
			1801021202040303	186	70	Moderate
			1801021202040304	94	21	Low
	Sulphur Glade Creek - Waldorf Flat			924	34	Low
		Marcels Ranch - Deep Gulch		112	22	Low
			1801021202050302	40	28	Low

Environmental Consequences

Analysis Methodology

Proposed Project prescriptions and elements are analyzed in part to determine if Aquatic Conservation Strategy Objectives, found at the end of this report, will be met in accordance with the Shasta Trinity National Forest Land and Resource Management Plan. The analysis is also done to determine if adverse effects are likely to occur to any of the fishes or fish habitats listed at the beginning of this document. The Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (AP, 2004) was used as the guiding document and evaluation standard. Project effects are described below and summarized near the end of this report against relevant 'habitat indicators' as described in the AP.

Effects Analysis of the Proposed and other Alternatives

The entire population of Habitat Indicators used to assess potential Project impacts to physical habitat components are presented in Appendix A. As stated in the AP document: "Determine which indicators cannot be affected by any Project Element of the action because there is no causal mechanism". Thorough review and analysis, and discussion with other Project team members combined with professional judgment has limited the potential effects of this Project to the physical Project habitat indicators of 1) Riparian reserves; 2) Suspended sediment; 3) Large woody debris; 4) Pool Quality and frequency; and 5) Water temperature. This conclusion is based upon using the analysis factors of Proximity, Probability, Magnitude, Distribution, Frequency, Duration, Timing, and Nature (AP 2004). Use of the first three factors is often all that is required to conclude that there is no logical causal mechanism by which any or all Project elements could conceivably affect one or more Habitat Indicators. These five indicators are the

ones logically at risk from the nature of this proposed action and the proximity of them to streams and fish habitat.

Direct and Indirect Effects

Direct and indirect effects of the Project to the ESA listed and USFS Sensitive species and habitats are often discussed in general and not to each listed/Sensitive species individually, because of their similar physiologies and because habitat requirements largely overlap. Input specifically on coho salmon Critical Habitat is made where warranted, however.

Project Elements (PEs) are the five specific or grouped management activities listed above and in the Project EA: 1) thinning activities; 2) fuels reduction; 3) prescribed fire; 4) road maintenance/construction; and 5) legacy sediment site treatments.

Direct Effects

Direct effects of the Project are 1) those effects that may be associated with project activities that could cause immediate inputs of sediment, for example, to streams and/or 2) any activity occurring in or near stream channels that could directly harass or kill fish such as felling trees into streams regardless of intent.

No PE will occur in live streams except legacy site remediation (PE 5) when failing or undersized culverts are either removed or replaced. But even then, affected streams if flowing during treatment are carefully diverted into contained pipes placed within the channel or otherwise protected from the actual treatments so as to minimize turbidity and sedimentation to the streams. For the other four PEs, honoring riparian reserve corridor RPMs and BMPs as required will prevent stream channel disruption from occurring except when thinned and cut trees may fall into stream channels beneficially increasing LWD loads. Because there are no activities proposed within stream channels that are accessible to anadromous salmonids, the Project will have no direct effects on any of the ESA-listed or USFS Sensitive fish: coho salmon, Chinook salmon, steelhead, or Pacific lamprey and all of their habitats. See discussion under riparian reserves below.

Indirect Effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, often removed geographically, but are still reasonably certain to occur [50 CFR §402.02]. The remaining analysis is focused on indirect effects conceivably caused by the Project Elements and is organized by habitat Indicators and Factors.

Alternative 1-No Action

While fuels would be left on the ground in the No Action Alternative it is speculative, but probable, that this condition would precipitate future high intensity or catastrophic wildfires which have already been seen recently on the Forest. It is stated in the Project Physical Sciences Report regarding an untreated condition: “If a stand-replacing fire were to occur in the project area, erosion would occur on both metasedimentary and granitic soils. A stand-replacing fire would cause a loss of surface and soil organic matter”. But it is also true that equivalent roaded acre (ERA) values would be less over

the next few years if no action is taken against the current environmental baseline conditions (Tables 4 and 5 in the Physical Sciences Report) as long as a major wildfire or other major watershed development does not occur during that time period.

Alternative 2-Proposed Action

Existing Conditions

See the environmental baseline tables above and the description of conditions in action area creeks, particularly Hayfork Creek.

Project elements will be assessed against the habitat indicators chosen for this Project.

Habitat Indicator - Riparian Reserves

Riparian Reserves are properly functioning in Butter, Rusch and Tule/West Tule Creeks. Adequate shade is present in the EEZs of all streams. See the tables and specifications listed below collected from the Project EA and the baseline tables above.

Project Implementation and Post Project Conditions

Any possible harm or adverse effects to fishes or aquatic habitats generated from implementation of this Project would have to occur from actions originating from or transported through riparian reserve habitat. But the EA and Physical Science report list so many management standards, resource protection measures (RPMs) and Best Management Practices (BMPs) that protect streams and riparian reserves (many duplicated below) that it becomes virtually impossible for the RRs and at least the anadromous fish aquatic habitat indicators to receive measurable adverse effects from this Project, be it directly or indirectly, if implemented as required by the RPMs and BMPs.

Project Elements Thinning, Fuels Treatments and Prescribed Fire

From the Physical Sciences Report based on the Forest's LRMP, regardless of the Project element:

- Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

- Design fuels treatment activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fuels management activities could be damaging to long-term ecosystem function.

- Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

Water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with Aquatic Conservation Strategy objectives.

Land management protection measures relevant to this project include:

- All roads within Riparian Management Zones[7] shall be surfaced with competent rock to a sufficient depth prior to use of the road to prevent road fines from discharging into watercourses.
- There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard.
- There is no removal of trees from unstable areas within Riparian Management Zones that have the potential to deliver sediment to a water of the State unless the tree is causing a safety hazard.

Please refer to further discussion about riparian reserves and the objectives of the Aquatic Conservation Strategy in the project Physical Science Report and addressed at the end of this report.

Note the riparian reserve widths and the Equipment Exclusion Zone specifications in Table 8 below and in Table 3 of the Project EA, as described in the Forest's Land and Resource Management Plan.

Table 8. Riparian Reserve Habitat Management Widths Based on Stream Type.

Stream and/or Waterbody Category	Extent of Riparian Reserve Width	Equipment Exclusion Zones (EEZ)
Intermittent streams	The stream and the area from the edge of the active stream channel to the top of the inner gorge, or a distance equal to the height of 1 site potential tree on each side of the channel, or 100 feet on each side of the channel, whichever is greatest.	The stream channel and the area from the edge of the channel to the top of the inner gorge, or a distance of 50 feet on each side of the channel, whichever is greatest. Areas within Riparian Reserves with slopes greater than 35%, highly erodible soils, or high soil compaction risk are also included in the EEZ.

[7] Riparian Management Zone is not the same as Riparian Reserve. The Riparian Management Zone width is 100 feet for perennial streams and 50 feet for intermittent streams.

Stream and/or Waterbody Category	Extent of Riparian Reserve Width	Equipment Exclusion Zones (EEZ)
Fish-bearing streams	The stream and the area from the edge of the active stream channel to the top of the inner gorge, or a distance equal to the height of 2 site potential trees on each side of the channel, or 300 feet on each side of the channel, whichever is greatest.	The stream and the area from the edge of the active stream channel to the top of the inner gorge, or a distance of 150 feet on each side of the channel, whichever is greatest.
Permanently flowing Non-fish Bearing Streams	Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.	

From the EA:

Riparian Reserve Stands	Understory treatment Remove all conifer trees less than 8 inches in diameter located within the dripline of larger trees. Space trees less than 8 inches in diameter 15 to 20 feet from one another.	Retain all true-riparian vegetation

Plantation Prescriptions

			Units in Riparian Reserves
Tree Density			
Pine Dominated Plantations			Average 135 trees/acre with varied spacing
Mixed Conifer Plantations			Average 200 trees/acre with varied spacing
All stands greater than 12 inches dbh			Depending on species, average 135 to 200 trees/acre
Conifer			Priority for conifer retention is: sugar pine, Douglas-fir, ponderosa and Jeffrey pine, incense cedar, and white fir that are dominant, co-dominant, or intermediate. Species diversity will be encouraged.
Hardwood			Retain all dominant, co-dominant and healthy intermediate class hardwoods.

The following are RPMs outlined in the Project EA that address riparian reserves and are intended to protect their integrity:

1. All heavy equipment is excluded from EEZs, except at designated crossings. All EEZs will be flagged on the ground and identified as "streamside buffer" on project maps.
2. Thinning ladder fuels up to eight inches and pruning up to eight feet are permissible in EEZs up to the high water mark. Hand treatments will have limited ground disturbance in the EEZ and will minimize disturbance to riparian plant species.
3. When snags are felled within the intermittent stream EEZ, they will be left unless there is a site specific reason for removing them, such as desired coarse woody debris levels are met and heavy fuel loading occurs (greater than 20 tons/acre), or the tree is within 200 feet upstream of a culvert and threatens stability of road infrastructure. If heavy fuel loading occurs, 20 tons/acre of the largest CWD will be left. In the stream channel, the small material that can clog a culvert resulting from fallen trees within 200 feet upstream will be removed.
4. Unmapped Riparian Reserves will be identified and protected prior to and/or during implementation, in accordance with appropriate protection measures (see Table 8 above). Upon field review, if ephemeral streams show no sign of annual scour or deposition (i.e., are upland swales) they do not meet the Forest Plan definition of a seasonal or intermittent channel and therefore do not have Riparian Reserves.

5. In Riparian Reserves where a road runs parallel to a perennial or intermittent stream and/or bisects the Riparian Reserve by winding in and out, treatment may occur uphill of the road, even if the area uphill of the road is closer to the stream than 150 feet.
6. Hand piling and pile burning will not occur within the EEZs. However fire may be allowed to back into these areas, providing the spread will be controllable.
7. See more detail on Riparian Reserve technical function under the Methodology section of the Project Physical Sciences Report (2019).

Roads and Landings, skid trails, and crossings within Riparian Reserves

8. Existing landings within the Riparian Reserve can be reused; however, the area of disturbance will not be increased and these features will be tilled[8] and seeded[9] following use where they do not need to be retained as part of the road system.[10]
9. No new landings will be constructed within the Riparian Reserve. No existing landings within EEZs will be used unless they are connected to a system road.[11]
10. No full bench skid trails will be constructed within the Riparian Reserve.
11. Stream crossings will be rocked. Those crossings proposed on perennial streams that are fish-bearing or have the potential to be fish-bearing will be constructed to maintain fish passage[12] and will be reshaped and stabilized following use. If intermittent stream crossings are left in place for wet weather operations, they will be removed during the following dry season.
12. During construction of temporary stream crossings, disturbance to existing live vegetation will be minimized to the maximum extent possible. When the crossing is rehabilitated, fill will be pulled back from the crossing so that the original stream level is re-established when the culvert is removed.
13. No skid trails will be built on active landslides or within inner gorges, and no existing skid trails on active landslides or within inner gorges will be used.

See also the riparian reserve protection and treatment portions of the Physical Science Report. For example, prescribed fire is proposed to back into RR designations within all project area subwatersheds. The project also proposes only low severity backing fire to enter the RRs. Significant levels of live vegetation and larger sized dead vegetation in riparian reserves are not expected to be consumed because live and dead fuel moisture is higher adjacent to streams. Due to the low intensity of fire allowed to back into RR areas there will be no effect to thermal regulation, nutrient filtering, surface erosion,

[8] Tilling refers to the use of machinery to break the soil surface to loosen compacted soil and increase permeability.
[9] See specifications on tilling in the Soils/Hydrology Resource Protection Measure section below and specifications on seeding in the Noxious Weed Resource Protection Measure section above.
[10] Wide areas along roads used as landings are often also used as turn outs for vehicle traffic and are considered part of the road system. Where these occur within Riparian Reserves, they will be retained.
[11] Road pullouts are sometimes used as landings.
[12] Forest Plan Standard and Guideline, page 4-55 in the Forest Plan.

bank erosion, channel migration and LWD as the integrity of riparian buffer areas would be maintained and project actions will not measurably alter any riparian functions.

Prescribed fire treatment in riparian reserves is expected to minimize the risk of future extreme fire behavior in riparian habitats. Due to RPM implementation, the integrity of RRs and stream channels will be protected from adverse indirect effects of proposed actions. There is a discountable probability that the project will lead to adverse impacts to RRs and high probability that the project will reduce potential future impacts to RRs from wildfires.

Other RR BMPs include:

An equipment exclusion zone (EEZ) will be utilized within the Riparian Reserves to:

Avoid unacceptable impacts to riparian vegetation, groundwater recharge areas, steep slopes, highly erodible soils, or unstable areas.

Maintain or provide sufficient ground cover to encourage infiltration, avoid erosion, and to filter pollutants.

Avoid detrimental soil compaction.

Retain trees necessary for shading, bank stabilization, and as a future source of large woody debris.

Retain floodplain function.

Mark the boundaries of the Riparian Reserves and EEZs on the ground before land disturbing activities.

There are many more RR BMPs found in the Physical Sciences Report that are not included in this document, all of which combine to ensure that harm is minimized if not eliminated that could otherwise be caused by sedimentation, water temperature increases, and other possible adverse RR management outcomes.

The sum of all proposed project activities (see Treatment Methods under the Proposed Action block of the Project EA) within and outside of RRs - Whole tree yarding; Mastication; Hand thinning; Hand piling; Machine piling; Pile burning; Jackpot burning; Broadcast burning; Pruning; Utilization; and Release – will have no adverse effect to Project area riparian reserves near or adjacent to anadromous fish or their habitats due to all of the RPMs, BMPs, and other mitigation measures restricting operations within them and the commitment to guidance of the ACS along with EEZs near streams and in RRs.

See a detailed discussion about cable and aerial yarding techniques in the Project Physical Sciences Report (2019).

Roads will be outsloped to facilitate traffic and proper drainage. Vegetation will not be disturbed within the road clearance limits and stream crossings. Crossings over

intermittent and perennial streams will be designed to maintain fish passage. Temporary crossings will be removed, rehabilitated, reshaped and stabilized in order to restore the natural hydrologic flow path. Roads rutted by operations shall be spot rocked or otherwise suitably repaired. Unsuitable slide and excess fill shall be disposed of in stable, non-floodplain sites.

In summary, implementation of the Project Elements 1) thinning activities; 2) fuels reduction; 3) prescribed fire; and 4) road maintenance/construction will not lead to harm or degradation of riparian reserves and in turn not lead to harm or degradation to adjacent aquatic habitats including those accommodating fish addressed in this report. Adequate RPMs and BMPs are in place to protect the RRs. Post project conditions will not vary much from existing project conditions initially. With time the project should produce timber stands of larger and healthier trees and some of these will be available for recruitment as LWD for RRs and streams.

Habitat Indicator - Suspended Sediment/Stream Substrate

Existing Conditions

Butter Creek, Rusch Creek and Tule/West Tule Creeks are currently Properly Functioning with regard to these two parameters. This conclusion covers a time range of a decade or more for observations and stream condition inventories so stream conditions appear to be stable and of generally good quality. Pool tail fines as indicated from the SCIs are at Properly Functioning levels.

Post Project Conditions

Introduction of fine-grained sediment to Project-adjacent streams is the most feasible means by which detrimental effects to fish and aquatic systems could be realized via Project implementation.

The Project Physical Sciences Report addresses all of the laws and regulations that are intended to minimize or eliminate accelerated sedimentation from Project-related activities. Such stipulations include the Aquatic Conservation Strategy of the Forest's LRMP and the Northwest Forest Plan; the National Forest Management Act: Forest Service Region 5 Water Quality Management Handbook; Project NEPA analysis; the North Coast Regional Water Quality Control Plan and their Waiver of Waste Discharge Requirements; and the Water Board TMDL and water temperature guidance.

The following table originates in the Physical Sciences Report. Note that the top two project action lines in the table produce decreasing levels of sediment each of the first five post-project years. Also note that the sediment produced is more than offset by treatment of legacy sites listed as per Project Element 5 during every year as well. None of this sediment is expected to reach anadromous fish habitat in measureable quantities because of geographic proximity/distance of actions to such habitat.

Table 9. Tons of sediment produced per year by project activities for five years.

Tons of sediment produced by project activity	Year 1	Year 2	Year 3	Year 4	Year 5	**Total**
Mechanized thinning	413	355	322	298	280	1668
Hand piling and burning	409	296	230	181	145	1261
Road improvements	-2298	-2298	-2298	-2298	-2298	-11489
All project activities	-1476	-1647	-1746	-1818	-1873	-8559

Sediment sources excluding poor land management practices within riparian areas or poorly constructed stream crossings are most often generated from roads in forested watersheds. "Road networks in many upland areas of the Pacific Northwest are the most important source of management-accelerated delivery of sediment to anadromous fish habitats. The sediment contribution to streams from roads is often much greater than that from all other land management activities combined, including log skidding and yarding" (FEMAT, 1993, page V-16). Road/landing-related RPMs follow regarding sedimentation, continued from page 39 above:

14. Examples of RPMs listed in the Project EA that address sedimentation reduction directly concern new landing construction, a Project element: "New landings will be restricted to slopes less than 20%. They will not be placed in unstable areas, below landslide benches or on slope positions that have the potential to deliver sediment to streams. Cut and fill slopes will not exceed 5 feet in height unless approved by an earth scientist in advance".

15. Another RPM involves stream crossings that apply to two Project elements: "Where necessary, stream crossings would be reconstructed to disconnect the road drainage from the waterbody in order to avoid or minimize water and sediment from being channeled into surface waters and to accommodate bankfull flows. Reconstructed stream crossings will sustain bankfull dimensions of width, depth, and slope and maintain streambed and bank resiliency and continuity through the structure. Culverts will be aligned with the natural stream channel".

The majority of Project BMPs and RPMs listed in the Project EA and the Physical Sciences Report are intended directly or indirectly to decrease or eliminate accelerated sedimentation into adjacent stream courses. That applies to all of the five Project elements. The multiple forms of implementation outlined above may indirectly affect turbidities for short periods of time, however the magnitude is expected to be small. One example project element is described below.

<u>Project Element: Prescribed Fire</u>

The combined treatment units propose prescribed fire to back into RR areas adjacent to, in part, intermittent and perennial streams but away from anadromous fish or other fish habitats. Low severity backing fire will be allowed to enter riparian reserve designations

which is not expected to negatively affect RR function. Because fire is a natural watershed disturbance in this area, native species are adapted to persist under the natural fire regimes and associated watershed conditions. Although USFS Sensitive and MIS anadromous and resident fish may be exposed to slight increases in turbidity during storms post-project, there is low probability that the amount and portion generated from project actions would adversely affect patterns of migration, spawning, or rearing.

Sedimentation resulting from the Project facing any SONCC coho salmon residing at the closest many miles downstream in the South Fork Trinity River, is expected to be non-existent or possibly be immeasurable, of low intensity, and discountable beginning with and after several rain events. Such introduced sediment is at most only slightly more of an issue upstream to resident trout-bearing stream courses or those perennial stream segments accommodating no fishes.

Project Element: Fuels Treatments

As stated in the Project EA: "There is a need to reduce fuels along roads and within and adjacent to plantations in this area to break up fuel continuity and allow for increased fire suppression capability by providing safe ingress/egress".

Fuels treatments include cutting, mastication, chipping, pruning and piling.

Only hand treatments will occur in the EEZs. Fire will be allowed to back into these areas providing that the spread can be controlled. All heavy equipment is excluded from EEZs, except at designated crossings. Small amounts of sediment may reach intermittent and perennial streams within the project area. Because of the RPMs and BMPs in place this amount is expected to be immeasurable.

Project Element: Landing construction and maintenance and road maintenance

Roads would be outsloped to facilitate proper drainage. Vegetation will not be disturbed within the road clearance limits and stream crossings. Crossings over intermittent and perennial streams will be designed to maintain fish and aquatic organism passage. Temporary crossings will be removed, rehabilitated, reshaped and stabilized in order to restore the natural hydrologic flow path. Roads rutted by operations shall be spot-rocked or otherwise suitably repaired. Unsuitable slide and excess fill materials shall be disposed of in stable, non-floodplain sites.

No new landings would be constructed in the RRs. Existing landings can be reused such that disturbance will not be increased. Landings used would be tilled and seeded following use when they do not need to be maintained as part of a road system. Existing landings would be used as much as possible outside of the RRs.

Small amounts of sediment may reach intermittent and perennial streams within the project area but most likely would occur during implementation of project element five, legacy site remediation. Although some individual anadromous fish – excluding coho

salmon - may be exposed to slight increases in turbidity and fine sediment during initial storms post-project, there is low probability that the amount generated from project actions would adversely affect water quality, anadromous fish life cycles and anadromous fish habitats of Sensitive and MIS fish species. Coho salmon are not present in the Project area stream reaches addressed with implementation of Project Element 5 nor downslope from all proposed activities. See discussion under the Hayfork Creek environmental baseline.

Habitat Indicators - Large Woody Debris and Pool Quality and Frequency

Existing Conditions

LWD is properly functioning in Butter and Rusch Creeks but functioning at risk in Tule Creek. Pool frequency is properly functioning in all three streams. Pool quality, conversely, is functioning at risk in all three streams based on the mean pool depths. The introduction of additional LWD can create new pools and deepen already existing pools. Plus, the 'roughness element' that they introduce can decrease the deposition of fine sediment within pools during storms leaving less sediment in the pool afterwards. See the desired LWD criteria developed for the Forest in Appendix A. An extended discussion on LWD in Streams can also be found in the Project Physical Sciences Report (2019).

Post Project Conditions

It is worth noting that large (coarse) woody debris quantities are also monitored on forested slopes away from streams such that five logs per acre yielding 4-8 tons per acre of coarse woody debris fuels is desirable for soil development purposes (Project Physical Sciences Report). Such logs should be 20 inches or larger in diameter and ten or more feet long.

Treatment prescriptions within Project Elements 1-3 are considered below with regard to LWD and Pool Characteristics.

<u>Project Element: Thinning</u>

Project Prescriptions propose thinning to favor the best, healthiest trees that have a high canopy capacity. Those trees that provide valuable wildlife structures will be considered as part of the shade retention objective. See RR prescriptive treatments listed above in Table 1. All heavy equipment is excluded from the EEZs. Hand treatments will have limited ground disturbance and will not disturb riparian plant species.

<u>Project Element: Prescribed Fire Treatments</u>

Prescribed fire is proposed in RR designations in all project area subwatersheds.

Treating riparian reserves with prescribed fire may have slight positive long term effects to LWD levels by protecting these areas from burning under high fire severity conditions in the future. High severity wildfire in RRs would have the potential to consume large wood and decrease large wood recruitment.

Low severity fire backing downslope into RRs will not burn hot enough or long enough to consume existing instream large wood and will not reduce future large wood recruitment. Back burning in RRs is expected to have discountable effects to LWD.

Project Element: Fuels Treatments

All snags greater than 15 inch dbh will be retained on this Project unless they prove to be a hazard. The Project thinning prescriptions will encourage growth of larger trees and some of these may be available for future recruitment of LWD. Large diameter LWD would improve pool quality once fallen. Reducing hazardous fuels will help reduce the chance of future catastrophic fires in the RR that could in turn reduce future LWD recruitment.

Project Element: Landing construction and maintenance and road maintenance

Adequate RPMs are in place to protect the RRs from this activity. Post project conditions concerning the habitat indicators will not vary much from existing project conditions regarding this element.

Habitat Indicator: Water Temperature

Existing Conditions

Observe the water temperature criteria deemed suitable and unsuitable for streams on the Forest in Appendix A. In the Environmental Baseline Tables above, Butter and Rusch Creeks have Properly Functioning traits, but Tule Creek was Functioning at Risk in 2003 during that survey. Lower Hayfork Creek has been measured as high as 85 degrees and unfortunately serves as a prohibitive thermal barrier or curtain to the passage and residency of coho salmon (NMFS 2014).

See additional information on water temperatures and stream shading under the Section with that title in the Project Physical Sciences Report (2019).

Post Project Conditions

The most feasible means by which water temperature could be at risk of increasing due to project implementation would be from removal of single-layer tree shade canopy over stream water surfaces which would allow more direct sunlight to reach it. Canopy closure will be intentionally decreased on some forested slopes slated for thinning outside of RRs in order to decrease the ease of crown fires. But there should be little to no canopy shading reduced within RRs over flowing waters. Reduction of flows in a constant air temperature environment can also increase water temperatures but there is no aspect of the Project proposed action that should lead to reduced streamflow on a sustained basis, nor when streams are diverted for legacy sediment site treatments. More dramatic changes to stream courses such as channel widening which would result in shallower water with more exposed water surface area could also result in greater water temperatures in summer but that possibility is nil in relation to this project.

Alternative 3

See the 'Alternative Comparison Table' in Appendix B of the Project EA to compare all alternatives to each other in a tabularized, summarized format. Pre-project or existing conditions for the following alternatives would be the same as those stated above for Alternative 2 and in preceding portions of this document.

As stated in the Project EA: "Alternative 3: This alternative would occur within the same boundaries and have the same treatments as Alternative 2 however there would be no machine piling or mastication in treated units, no use of dozers for control line preparation, and no mechanized equipment use in Riparian Reserve (RR) land allocations".

There are 14 treatment actions and prescriptions identified in the Alternative Comparison Table of Appendix B of the Project EA. The preferred alternative treatment area is 4,025 acres for buffers and plantations. With alternative 3, the treatments of Mastication and Machine Piling would be implemented in zero project acres instead of a significant percentage of the 4,025 acres of the preferred alternative. There are four other treatments or prescriptions listed in Appendix B where the acreages of treatment are the same for alternatives two and three, but where there are no mechanized equipment allowed. There are three prescriptions in which only hand treatments are allowed with Alternative three as stated above.

The most logical means by which aquatic resource effects could be different compared to the proposed action alternative 2, would be from a reduced potential for fine-grained sedimentation to be introduced into stream courses. Less machine-related activities especially by avoiding RRs altogether decreases the probability of inadvertent sources of sediment generation into water bodies or stream courses.

Examples follow.

Post Project Conditions

Habitat Indicator: Riparian Reserves

Project Prescriptions propose thinning to favor the best, healthiest trees that have a high canopy capacity. Those trees that provide valuable wildlife structures will be considered as part of the shade retention objective. All heavy equipment is excluded from the EEZs and the RRs. Hand treatments will have limited ground disturbance and will not disturb riparian plant species. Project prescription RPMs include specifications that no full bench skid trails or new landings would be constructed in the RRs. Existing landings in the RRs can be reused. The area of disturbance there cannot be increased and the area will have to be tilled and seeded after use. No existing landings will be used in the EEZs unless they are connected to a road system. Overall the Project Prescriptions would have a neutral short term affect and may have positive beneficial effects on RRs.

Less disturbance in the outer RRs may preserve more riparian vegetation which could have a more beneficial short-term effect on soil cover and soil moisture content.

Project Element: Thinning treatments

The Project thinning prescriptions will encourage growth of larger trees and some of these may be available for future recruitment of LWD. Large diameter LWD would improve pool quality. Reducing hazardous fuels will help decrease the chance of future catastrophic fires in the RRs. Under this Alternative there would probably be a larger number of snags available for recruitment as LWD compared to the Proposed Alternative 2. More wood could also initially be available for LWD compared to the Proposed Action; however, the Proposed Alternative manages for larger sizes of dominant trees. If larger sized trees were recruited as LWD they would provide higher quality pool habitat.

Project Element: Fuels Treatments

Only hand treatments will occur in the RRs. All heavy and mechanized equipment is excluded from RRs, except at designated crossings. There is no need for EEZs because of this. The fuels prescriptions are less intensive than for the proposed Alternative. Compared to the proposed alternative even smaller amounts of sediment are expected to reach intermittent and possibly perennial streams within the project area. The same abundant RPMs (82 in the Project EA) and many more in the form of BMPs in the Physical Sciences Report will be in place. As in the proposed alternative the amount of sediment is expected to be immeasurable and so minimal as to be discountable.

Project Element: Prescribed Fire

The overall prescribed fire effects are similar to Alternative 2. Prescribed fire is proposed to occur in RR land designations in all project area subwatersheds via backing down into it from outside areas.

Project Element: Landing construction and maintenance and Road maintenance

The Analysis for Landing Construction and maintenance and Road maintenance of Alternative 3 is the same as for the Preferred Alternative.

Alternative 4

This alternative differs from Alternative 2 by having an 18 inch maximum tree diameter limit for cutting (as opposed to a 16 inch limit with alternative 2) in LSRs, RRs and natural stands. Snags greater than 18 inches will be retained whenever safe, whereas snags greater than 15 inches would be retained in the preferred alternative. This stipulation will direct a 'thin from below' operation up to the 18 inch diameter limit along the road buffers. Plantation operations will not change but prescriptions will, as noted below.

The Alternative comparison Table in the Project EA Appendix B would be altered on four natural stand prescriptions where the 15 inch tree diameter limit is expanded to 18 inch diameter, and four plantation prescriptions in which the same size diameter increase also applies.

There will be at most minor increases in detrimental aspects of habitat indicators under this alternative. Slightly greater overall cutting activity provides additional ways to

generate sediment. Overall shade canopy and percentages would have to be slightly less with a greater size limit on the trees that can be felled on forested side slopes but decreasing canopy cover away from RRs is often desirable in order to decrease the potential for escalation of ground fires into crown fires.

New landing construction will be minimized in LSR and spotted owl Critical Habitat. The Analysis for Landing Construction and maintenance and Road maintenance of Alternative 4 is the same as for the Preferred Alternative. Other treatments would be identical to alternative 2.

Post Project Conditions

Habitat Indicator: Suspended Sediment/Substrate

Only hand treatments will occur in the EEZs. All heavy equipment is excluded from EEZs, except at designated crossings. Compared to the Proposed Alternative slightly higher amounts of sediment could reach intermittent and perennial streams within the project area. This is because trees can be cut up to 18 inch dbh. More snags would be cut as snags greater than 18 inch instead of 15 inch dbh would be retained. All 82 RPMs will be in place. As in Alternative 2 the amount of sediment is expected to be immeasurable and therefore discountable.

Habitat Indicator: Large Woody Debris and Pool Quality and Frequency

Initially there would be a decrease in potential LWD as trees could be cut up to 18 inch dbh. Under this Alternative snags greater than 18 dbh would be retained in LSR and RRs. There would be fewer snags available for recruitment as LWD compared to the Proposed Alternative 2 which retains snags greater than 15 inch dbh but the larger more valuable snags would persist.

The Project thinning prescriptions will encourage growth of larger trees and some of these may be available for future recruitment of LWD. LWD would improve pool quality. Reducing hazardous fuels will help reduce the chance of future catastrophic fires in the RRs. Effectively both Alternative 4 and the Preferred Alternative 2 manage for larger sizes of dominant trees. If larger sized trees were recruited as LWD they would provide higher quality pool habitat.

Less shading may be discernable in areas subject to the increased cutting between 15 inches dbh and 18 inches dbh including RRs wherever single layer canopy shading is occurring. Long term both Alternative 4 and the Preferred Alternative manage for growth of larger diameter trees which would be available for recruitment as LWD. Shade and canopy cover is expected to remain adequate in the RRs under both Alternative 4 and the Preferred Alternative 2.

Habitat Indicator: Riparian Reserves

Project prescription RPMs include specifications that no full bench skid trails or new landings would be constructed in the RRs. Existing landings in the RRs can be reused. The area of disturbance there cannot be increased and the area will have to be tilled and seeded after use. No existing landings will be used in the EEZs unless they are

connected to a road system. Overall the Project Prescriptions would have a neutral short term effect and may have positive beneficial effects on RRs.

The tree cutting proposed is more aggressive compared to the Preferred Alternative with the size limit increased to 18 inches. A decrease in shade in the RRs is likely to result in the short term but would not occur on water surfaces within the inner RRs; larger trees above the cut limit are providing the majority of the shade. Post Project Conditions point toward more growth of these larger trees which would increase canopy cover.

Effects are similar to the Preferred Alternative, Alternative 2, for landing construction and maintenance and road maintenance.

Alternative 5

This alternative proposes the same actions as the Preferred Alternative but limits the road treatment buffers to fifty feet on both sides of the road for a total buffer treatment depth of 100 feet. The proposed action (alternative 2) allows for a 300 foot distance total buffer with a minimum treatment of 25 feet on one side of the road. Alternative 5 also allows for a 100 foot treatment area around plantations.

Treatment acreage (Appendix B, Project EA) would decrease to 2,270 acres. Natural stand prescription acreages are also reduced by about half compared to the preferred alternative.

Project Element: Prescribed Fire

Habitat Indicators: Suspended sediment-intergravel dissolved oxygen/turbidity-riparian reserves

Identical to the preferred alternative, low severity backing fire will be allowed to enter RR areas which is not expected to negatively affect RR function.

Fire is a natural watershed disturbance in this area, therefore native species are adapted to persist under the natural fire regimes and associated watershed conditions. There is low probability that the amount of fine sediment generated from project actions would adversely affect patterns of fish migration, spawning, or rearing.

Because the footprint for Alternative 5 consists of a treatment area that is smaller than the Preferred Alternative the amount of sediment produced regardless of its ultimate fate is expected to be less than that of the Preferred Alternative.

Project Element: Fuels Treatments

Only hand treatments will occur in the EEZs. All heavy equipment is excluded from EEZs, except at designated crossings. Smaller amounts of sediment are expected to reach intermittent and perennial streams within the project area because the overall fuels treatment area is smaller than that of the Preferred Alternative.

Project Element: Landing construction/maintenance and road maintenance

Sediment production is expected to be less than the Preferred Alternative due to the smaller treatment area involved in Alternative 5 – about half the acreage. Fewer landings would be required.

Habitat Indicator: Large Woody Debris and Pool Quality and Frequency

Project Element: Prescribed Fire Treatments

Low severity fire backing downslope into riparian reserves will not burn hot enough or long enough to consume existing instream large wood and will not reduce future LWD recruitment. Back burning in RRs is expected to have discountable effects to LWD. The treatment buffers are smaller than for the Preferred Alternative and any short term impacts are expected to be minimal. Treating riparian reserves with prescribed fire may have slight positive long term effects to LWD levels by protecting these areas from burning under high fire severity conditions in the future. High severity wildfire in RRs would have the potential to consume large wood and decrease large wood recruitment.

Project Element: Fuels Treatments

All snags greater than 15 dbh will be retained in this alternative unless they prove to be a hazard. The Alternative 5 thinning prescriptions will encourage growth of larger trees and some of these may be available for future recruitment of LWD. Large diameter LWD would improve pool quality. Reducing hazardous fuels will help reduce the chance of future catastrophic fires in the RRs. In RRs trees proposed for cutting would be 8 inch dbh or less. Trees this size are too small to be of current value to LWD recruitment. Long term the benefits for larger tree growth are not as great for Alternative 5 compared to the Preferred Alternative 2 because of the reduced areas of fuels treatment.

Due to the smaller Project treatment acreage fuels reduction benefits will not be as great. Protection from catastrophic fires will be somewhat less compared to the Preferred Alternative.

Alternative 6

This alternative duplicates the preferred alternative 2 but excludes any botanical avoidance areas that account for 269 acres in the other alternatives.

There would be potentially greater amounts of sediment generated regardless of its fate due to more acreage receiving treatment compared to Alternative 2, but any increased quantities would likely be discountable.

Alternative 6 has been dismissed from further consideration.

Alternative 7

This alternative limits treatment to plantations only, therefore no road buffers would be treated. The Forest has opted not to analyze this alternative further because it does not address the original project purpose and need concept sufficiently enough. If it were analyzed and adopted at some point, the alternative would implement the plantation portion of the preferred alternative regarding the same 1,239 acres involving that portion.

Discussion and Conclusions

Alternative 1 – No Action

Taking no action will allow for ERA values to decrease over the next two, four and six years depending on the extent of other actions in the area. See Table 5 in the Project Physical Sciences Report (2019). But the Project's Purpose and Need will have not been achieved which was developed by a Collaborative Group to be a very important action to take. No action would ensure that extreme wildfire behavior would be inevitable in the general area which could jeopardize many human lives and devastate the forest ecosystem.

Alternative 2 - Proposed Action

Riparian areas proposed for prescribed fire treatments are predicted to burn at low severity. Only backing fires would be allowed to burn in the RRs. This would help to retain soil cover and reduce erosion potential.

Prescriptions are designed to meet forest soil ground cover requirements in treated areas and implementation of RPMs and BMPs will minimize accelerated erosion. These measures stipulate that post-treatment total soil cover should average across the affected Units between 50 and 70 percent on metamorphics with at least 50 percent cover as fine organic matter comprised of duff, litter, plant leaves/needles, fine slash <3 inch material, etc. Treatment areas on shallow soils that are susceptible to displacement should only be conducted when soils are dry and on slopes less than 35%. This would help to retain soil cover and reduce erosion potential.

Hazard trees cut would be retained on site in the RRs. Fine sediment exposed by Project prescriptions may be washed downslope during the first few post-burn precipitation events large enough to cause runoff from hillslopes. Most fines would settle out in vegetation and duff but some may be delivered to intermittent or perennial stream channels upstream from SONCC coho salmon unoccupied CH during storm events. Growth of herbaceous vegetation during the first growing season after prescribed fire treatments would further reduce the risk of sediment delivery to stream channels.

Prescribed burning may increase sediment yield at the site scale in the short-term; however, it is expected to have negligible effects to fish habitat indicators such as suspended sediment, substrate character, embeddedness and water temperature. In the context of existing instream habitat conditions, sediment and turbidity-related effects of the project will be of low magnitude and of a quantity that could not be meaningfully measured or evaluated. In the long term, the potential for controlling

future higher severity wildfire would be increased; this may have a long-term benefit for rainbow trout and all the other fishes considered in this report.

Only a few Project Prescription actions will occur directly upslope from unoccupied SONCC coho salmon CH in West Tule Creek near the streams riparian reserves. No changes are expected in West Tule Creek due to the multitude of RPMs and BMPs. Most other activities are miles away or upstream from unoccupied SONCC coho salmon CH. All project activities are many stream miles away from occupied coho salmon habitats which can eventually be found in the lower South Fork Trinity River.

The long term trend would be a slight or greater improvement in riparian and aquatic conditions in the action area because of the reduced threat of high severity wildfire in the watersheds. Distribution and population abundance of resident rainbow trout is expected to be unchanged as will be the result of all other anadromous fishes considered.

Note in Table 9 above that treatment of legacy site sedimentation threat problems will decrease the quantity of sedimentation by several multiples of tonnage over the quantities conceivably generated by the other four Project Elements.

Cumulative Effects – Alternative 2

The Physical Sciences Report and Table 7 above lists the existing ERA condition of the Project area watersheds and then the ERA values if the No Action alternative were chosen for years 2020, 2022, and 2024 (Table 5 in the Physical Sciences Report).

The majority of watersheds of various sizes are designated as having a Low Disturbance Level in the Existing Condition except the Butter Creek and Butter Creek Meadows watersheds which calculate as having a Moderate Disturbance Level (see the Forest's LRMP for analysis of the Disturbance Levels).

No hydrologic units of fifth through seventh field size are over the threshold of concern regarding cumulative watershed effects (Physical Sciences Report 2019). The Butter Creek sixth field sub-watershed has a moderate disturbance level. Several of the watersheds or subwatersheds that currently rank as having a Moderate Disturbance Level would decrease over the next few years to a low Disturbance level determination. If the preferred alternative were implemented, then a few watersheds at the 'HUC-8' small size level would increase to a moderate disturbance history only to decrease to a low level by 2024. One HUC-8 small watershed in the Butter Creek Meadows area would increase from moderate to high then recede back to moderate by 2024. No anadromous fish are near this small watershed.

The overall analysis relies on current environmental conditions as a proxy for the impacts of past actions and events. These past actions are reflected in the existing condition and the baseline environmental habitat evaluation. While indirect effects resulting from the Project may occur to a minor extent and for a short duration, these effects are too small to have an incremental effect on water resources and aquatic/riparian habitats. Prescriptions in RRs comprise only a small percentage of the

entire project and the 82 listed RPMs and numerous BMPs are adequate to reduce any persistent potentially harmful effect.

The Table that follows displays CWEs for the preferred alternative 2 and is originally located in the Physical Sciences Report.

Table 10. ERA for alternative 2 cumulative effects

Hydrologic Unit				2020		2022		2024		Disturbance Level
5	6	7	8	ERA (Acres)	Risk Ratio (% of TOC)	ERA (Acres)	Risk Ratio (% of TOC)	ERA (Acres)	Risk Ratio (% of TOC)	
Lower Hayfork Creek				4653	20	4185	18	3996	17	Low
	Grassy Flat - Miners Creek			862	15	769	14	730	13	Low
		Lower Hayfork Creek Canyon		338	23	292	20	280	19	Low
			1801021204050501	75	28	55	21	53	20	Low
			1801021204050503	45	27	37	22	36	21	Low
	Rusch Creek - Little Creek			1167	23	1079	21	1045	20	Low
		Rusch Creek		346	26	291	22	277	21	Low
			1801021204030401	136	49	105	37	99	35	Moderate to Low
			1801021204030402	107	33	89	27	85	26	Low
	Tule Creek - Hayfork Creek			679	28	560	23	528	22	Low
		Lower Tule Creek		445	31	362	25	338	23	Low
			1801021204020203	105	26	98	24	95	23	Low
			1801021204020204	121	27	85	19	83	18	Low
		Upper Tule Creek		280	23	243	20	235	19	Low
			1801021204020101	147	26	132	24	128	23	Low
			1801021204020104	55	24	35	16	33	15	Low
Middle South Fork Trinity River				6536	38	5868	34	5565	32	Low
	Butter Creek			2004	53	1656	44	1564	42	Moderate
		Upper Indian Valley Creek		749	61	635	52	600	49	Moderate
			1801021202040101	217	64	188	56	179	53	Moderate
			1801021202040102	122	50	110	46	106	44	Moderate

			1801021202040103	245	72	192	57	179	53	Moderate
			1801021202040104	165	53	144	46	136	44	Moderate
		Lower Indian Valley Creek		354	37	306	32	295	31	Low
			1801021202040201	169	40	148	35	143	34	Moderate to Low
			1801021202040203	84	52	60	37	56	34	Moderate to Low
		Butter Creek Meadows		901	58	715	46	669	43	Moderate
			1801021202040301	157	53	135	46	128	43	Moderate
			1801021202040302	243	73	205	62	191	57	Moderate
			1801021202040303	259	97	197	74	183	69	High to Moderate
			1801021202040304	198	44	136	30	127	28	Moderate to Low
	Sulphur Glade Creek - Waldorf Flat			866	32	814	30	779	29	Low
		Marcels Ranch - Deep Gulch		116	23	105	21	101	20	Low
			1801021202050302	51	36	45	32	43	31	Low

The potential for the Trinity County Roads and Plantations Pilot Project to meaningfully contribute to cumulative effects is considered low, as the duration of potential effects, in particular sedimentation, to instream and riparian habitat is expected to be short-term and discountable. No adverse Cumulative Effects to anadromous fish downstream or resident rainbow trout habitats in the watersheds are anticipated from implementation of the Preferred Alternative.

The Project is expected to improve watershed conditions in the long term as healthier timber stands would reduce fuel loading and provide protection from catastrophic fires, and because legacy sediment site treatments will decrease future tonnage of fine sediment otherwise generated.

Alternative 3

Very little if any mechanized equipment would be allowed in this alternative except for road and landing maintenance and Legacy site treatments. This choice would decrease ERA values associated with implementation of the project and therefore produce fewer tons of sediment generated throughout the 4,025 treatment acres. Lower CWE values would likely be generated as well.

Alternative 4

As stated in the Project EA: "This alternative would occur within the same boundaries as Alternative 2 however there will be an 18 inch diameter limit in Late Successional Reserve

(LSR), RR, and natural stands. New landing construction will be minimized in LSR and Critical Habitat (CH). Snags greater than 18 inches will be retained in LSR and RR when not deemed a hazard to roads, landings, or operations.

The prescriptions in the buffers along roads and plantations for this alternative are different than Alternative 2 in order to meet the desired conditions established in the purpose and need. These prescriptions will be a thin from below up to the 18 inch diameter limit. The prescriptions for plantations will be the same as described in Alternative 2."

As discussed above, there is a greater chance for fine grained sediment to be generated via the increased cutting generated from the greater tree dbh size limit. Increased solar radiation may reach segments of stream reaches because of the increased cutting. It is difficult to discern how the water temperature and sediment habitat indicators would fare differently upon choosing this alternative in terms of measureable differences, but the contrast with the preferred alternative would likely be minor. The remaining habitat indicators would most likely not measurably change.

Alternative 5

Project acreage would be reduced by about 50% compared to the preferred alternative and therefore the possible effects of any sediment generation or water temperature increases would be reduced by half as well. The cost however would be a similar reduction in meeting the total acreage goals of the purpose and need. In a sense, it could be viewed as a 'sliding scale' outcome between the No Action alternative and the preferred alternative in which this alternative is close to being half way between the two. Choosing this alternative option might be important to consider if the preferred alternative caused ERA and CWE values to move above thresholds of concern at the larger fifth-field sized watersheds, for example, but they do not cause such.

Alternative 6

It is not possible at this time to discern potential changes in results to the habitat indicators by omitting botanic areas of concern. With 269 acres involved, any differences to other alternatives would be subtle and likely undetectable.

Alternative 7

This alternative is not being addressed by the Forest because it fails to meet the Purpose and Need of the Project. Treating only plantation acreage is insufficient in meeting the needs of the landscape action area as now determined by specialists.

Effects Determination Summaries

Project Prescriptions and Effects

There will be no direct effect on perennial streams from Project prescriptions and action elements that occur outside of the perennial stream RRs excluding the occasional felling of hazard trees into flowing stream courses that would create beneficial LWD. The 82 RPMs listed in the Project EA include many applicable for wildlife, fisheries, riparian reserves, botany, soils, and hydrology. Fish bearing perennial streams would be protected with an EEZ within 150 feet of the stream edge. Perennial non-fish bearing streams and wetlands greater than one acre would also be protected with a 150 foot EEZ. When water is flowing in intermittent streams or exists in wetlands less than 1 acre, there would be an EEZ of 50 feet on each side of the channel or wetland (Project EA, Table 3).

All trees less than 8 inches in diameter at breast height (dbh) located within the dripline of larger trees outside of the EEZ can be removed. The strategy is to thin stands so that the highest needle or leaf cover provides the most shade to the forest floor. In the RRs hand treatments are permissible down to the high water mark. All riparian vegetation would be maintained. All heavy equipment is excluded from the EEZs. Hand treatments will have limited ground disturbance and will not disturb riparian plant species.

Project prescription RPMs include specifications that no full bench skid trails or new landings would be constructed in the RRs. Existing landings in the RRs can be reused. The area of disturbance there cannot be increased and the area will have to be tilled and seeded after use. No existing landings will be used in the EEZs unless they are connected to a road system. Water drafting would always occur in accordance with National Marine Fisheries Service (Appendix C) or LRMP guidelines. As stated in the Physical Sciences Report:

- When watering roads for dust abatement, follow these rules:
    - Allow drafting from fish-bearing streams only where immediate downstream discharge is maintained at 1.5 cubic feet per second or greater.
    - Allow drafting from intermittent streams, wetlands, or constructed ponds provided that sufficient water quantity and quality remains to support associated wildlife species and riparian values.
    - Never allow drafting to remove more than 50 percent of any stream discharge or 75 percent of constructed pond water.

A limited seasonal operating period would protect waterways during periods when anadromous fish – steelhead, Chinook salmon and Pacific Lamprey - are present near the Project area during the fish spawning. This is ensured by the following RPMs:

16. Field personnel and equipment will not enter waterways where anadromous fish are determined to be spawning or eggs would be incubating, as determined and indicated by a fish biologist. Restricted time periods are generally from October 15 through April 15. Maps will be provided to those responsible for implementation.
17. To avoid potential watershed-related impacts, including effects to anadromous fish, timber harvest activities will occur between April 15 and October 15 (Normal

Operating Season). Timber harvest activities may occur outside of the Normal Operating Season if authorized by the appropriate Line Officer when: 1) long-term weather forecast is favorable, 2) Best Management Practices (BMPS) erosion control work is current, and 3) acceptance of recommendations from a Forest Service (FS) fisheries biologist and/or hydrologist. The dates of operations may also be constrained as identified in the Forest's Wet Weather Operations Guidelines.

There should not be any adverse effects on the fishery resource from the current Project prescriptions. Fuel loading would be reduced in the Project areas. The Project would mitigate or reduce catastrophic fire effects and improve safety and forest health.

Sediment may be produced by end-lining however the volume is expected to be minimal. After initial rain events natural levels of turbidities would be restored. Additional RPMs in the intermittent stream areas would further mitigate undesirable effects. When snags are felled within the intermittent stream EEZs they will be left unless heavy fuel loading exceeds 20 tons per acre or the tree is within 200 feet upstream of a culvert and threatens stability of road infrastructure. If heavy fuel loadings occur, 20 tons/acre of the largest CWD will be left in the intermittent RRs.

Implementation of the proposed action in the form of the Project elements will create 1) no effects to unoccupied Critical Habitat of ESA listed as threatened SONCC coho salmon nor the salmon fish themselves due to their lack of presence in the project affected areas; 2) no effect to Essential Fish Habitat for coho salmon and Sensitive UKTR Chinook salmon, and aquatic habitats for Sensitive KMP steelhead; 3) no effect to Sensitive Pacific Lamprey and MIS designated spring-run Chinook salmon and spring-run (summer) steelhead, both of South Fork Trinity River origin; and 4) possibly minor effects to some MIS designated resident rainbow trout that would not adversely create harm to their reproductive viability. The Project could create possible incidental direct harm or injury to MIS rainbow trout from the felling of hazard trees within 150 feet of live streams possessing trout felled for the creation of beneficial large woody debris. Impacts to the listed MIS species and their habitat may be measureable in the short term but beneficial to their habitat in the long term.

Viability of Sensitive Fish Species

A trend toward ESA listing is not anticipated and viability of the four pertinent Forest Service Sensitive Species is not at risk. Implementation of any of the action alternatives meets Standards and Guidelines, will be implemented under exhaustive RPM and BMP stipulations, are subject to EEZs, and do not adversely modify fish and aquatic habitat in the long term. Individual anadromous salmonids or Pacific lamprey are not expected to be adversely impacted by the Project.

Aquatic MIS Species

In line with the discussions above, the Project will have zero impact to the two anadromous MIS fish species that could conceivably occur adjacent to or downstream from the proposed Project area due to the exclusion of entry into Riparian Reserve EEZ

habitat. Rainbow trout will largely receive no effects except for possibly one or a few individuals that could be harmed by the felling of trees left on site that could reach stream water surfaces containing trout. The aquatic habitat in such instances would benefit overall by seeing an increase in stream LWD.

TABLE 11. SUMMARY OF THE EFFECTS OF THE PROJECT ELEMENTS ON ANADROMOUS FISH AND THEIR HABITAT FOR EACH HABITAT INDICATOR.

Indicator	Thinning Activities	Fuels Reduction	Prescribed fire	Road Maintenance & Construction	Legacy Sediment Site Treatments
Temperature	0/+	0	0	0	0
Suspended Sediment/Substrate/Turbidity	0	0	0	0	0+
Streambank Condition	0	0	0	0	0
Chemical Contamination / Nutrients	0	0	0	0	0
Physical Barriers	0	0	0	0	0
Large Woody Debris	0/+	0	0	0	0
Pool Frequency and Quality/Large Pools	0/+	0	0	0	0
Off-channel Habitat	0	0	0	0	0
Refugia	0	0	0	0	0
Average Wetted Width / Maximum Depth pools	0	0	0	0	0
Streambank Condition	0	0	0	0	0
Floodplain Connectivity	0	0	0	0	0
Peak/Base Flows	0	0	0	0	0
Disturbance Regime	0	0	0	0	0
Riparian Reserves	0	0	0	0	0

Table 11, continued. Summary of the effects of the Project on anadromous fish and their habitat for each habitat Indicator.

Indicator	Legacy Sediment Site Treatments
Temperature	0
Suspended Sediment/Substrate/Turbidity	0+
Streambank Condition	0
Chemical Contamination / Nutrients	0
Physical Barriers	0
Large Woody Debris	0
Pool Frequency and Quality/Large Pools	0
Off-channel Habitat	0
Refugia	0
Average Wetted Width / Maximum Depth pools	0
Streambank Condition	0
Floodplain Connectivity	0
Peak/Base Flows	0
Disturbance Regime	0
Riparian Reserves	0

Notes 0: Neutral effect
0/+: Neutral effect short term, beneficial effect long te

Aquatic Conservation Strategy Objectives

The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and the aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the Forest Service and Bureau of Land Management within the range of Pacific Ocean fish anadromy.

This conservation strategy employs several tactics to approach the goal of maintaining the natural disturbance regime. Land use activities need to be excluded or limited in those parts of the watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows. Headwater riparian areas need to be protected, so when debris slides and flows occur they contain coarse woody debris and boulders necessary for creating habitat further downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of coarse woody debris to channels and provide shade and microclimate protection. Watersheds currently containing the best habitat or those with the greatest potential for recovery should receive increased protection and receive the highest priority for restoration programs.

Any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting the targeted species. The Aquatic Conservation Strategy must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation over broad landscapes as opposed to individual projects or small watersheds. Because it is based on natural disturbance processes, it may take decades, possibly more than a century, to accomplish all of its objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 to 20 years.

The important phrases in these standards and guidelines are “meet Aquatic Conservation Strategy objectives,” and “attain Aquatic Conservation Strategy objectives”. These phrases, coupled with the phrase “maintain and restore” within each of the Aquatic Conservation objectives, define the context for agency review and implementation of management activities. Complying with Aquatic Conservation Objectives means that an agency must manage the riparian dependent resources to maintain the existing condition or implement actions to restore conditions. The baseline from which to access maintaining or restoring the condition is developed through a watershed analysis. Improvement relates to restoring biological and physical processes within their ranges of natural variability.

The standards and guidelines are designed to focus the review of proposed and certain existing projects to determine compatibility with Aquatic Conservation Strategy objectives. The standards and guidelines focus on “meeting” and “not preventing attainment” of Aquatic Conservation Strategy objectives. The intent is to ensure that a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives. The decision maker will use the results of watershed analysis to support the finding. In order to make the finding that a project or management action “meets” or “does not prevent attainment” of the Aquatic Conservation Strategy objectives, the analysis must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it within the range of natural

variability. Management actions that do not maintain the existing condition or lead to improved conditions in the long term would not "meet" the intent of the Aquatic Conservation Strategy and thus, should not be implemented.

Forest Service and BLM-administered lands within the range of the northern spotted owl will be managed to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Due to the scope of the project, the proposed activities will have a neutral effect on the distribution, diversity and complexity of watershed and landscape-scale features. Tree removal and thinning, along with maintenance and prescribed fire may help reduce ladder fuels and provide for more growth potential of existing timber along with reducing the potential for unmanageable fires. For perennial fish bearing streams and perennial non fish bearing streams a 150 foot wide equipment exclusion zone (EEZ) will protect the inner RRs and adjacent streams. No heavy equipment will be allowed in the EEZs.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The proposed activities will have a neutral effect on the distribution, diversity and complexity of watershed and landscape-scale features. Only hand treatments (thinning, pruning, lopping and scattering) may occur in the EEZs. Hand treatments will minimize ground disturbance in the EEZs and will not disturb true riparian plant species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Due to the scope of the proposed activity the project will have a neutral effect on the physical integrity of the aquatic system. Large snags will be retained unless the snags are considered a hazard tree. No full bench skid trails or new landings would be constructed in the RRs. No existing landings would be used in the EEZs unless they were connected to a road system.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The combination of minimal disturbance in the RRs and the minimal change to existing shade conditions in the EEZ's would maintain existing stream temperature conditions.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Proposed activities would not significantly alter the fine sediment regime. No new landings will be constructed in the RRs. Existing landings would be used within the EEZs and the area of disturbance would not be increased. Additional sedimentation and runoff protections are in place. Landings would be ripped, seeded or mulched where they did not need to be retained as part of the road system. Work would be planned and accomplished during non-wet weather periods.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected. Large snags will be retained unless the snags is considered a hazard tree.

The proposed activity will have no effect on in-stream flows or patterns of sediment, nutrient and wood routing in the area. Stream flows would not be diverted. For the underburning prescriptions in the RRs, LWD will then be available for recruitment to form pools and to improve the quality of pools.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

The proposed activity the project will have no effect on the timing, variability or duration of flood plain inundation or water table elevation in the area. Maintaining riparian areas as well as not constructing new roads in the RRs would help to maintain existing conditions. A slight decrease in overstocked timber stands may slightly increase stream discharge in low water periods.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Treatments will minimize ground disturbance in the EEZs and will not disturb riparian plant species. Area of disturbance will not be increased in the RRs.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Increased resiliency to fires along with measures to protect RRs will help maintain flora and fauna distribution and diversity. Habitat beyond the RRs would be improved by increasing light penetration and potential increase in plant abundance.

The project will have a neutral effect on populations of native plants, invertebrates and vertebrate riparian-dependent species. A resilient forest ecosystem would be better for flora and fauna diversity and may mitigate catastrophic fire effects.

The prescriptions of this Project do not prevent attainment of the Aquatic Conservation Objectives.

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APPENDIX A

Shasta Trinity National Forest Tributaries Matrix of Factors and Indicators

This matrix shows criteria used to determine baseline conditions in 7th and 5th field watersheds.

Modifications agreed to by Level 1 representatives Allen Taylor (NMFS) and Loren Everest (USFS) on March 3, 2006.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
HABITAT:				
Water Quality:	**Temperature** [1] 1st - 3rd Order Streams [instantaneous]	67 F degrees or less	> 67 to 70 degrees F	> 70 degrees F
	4th-5th Order Streams[7 Day Mean Maximum]	70 degrees F or less	> 70 to 73 degrees F	> 73 degrees F
	Suspended Sediment - Intergravel DO/Turbidity[2]	Similar to Chinook salmon: for example (e.g.):-< 12% fines (<0.85mm) in gravel; e.g., ≤12% surface fines of ≤6mm. Turbidity Low	Similar to Chinook salmon :e.g., 12-17% fines (<0.85mm) in gravel; e.g., 12-20% surface fines of ≤6mm. Turbidity Moderate	Similar to Chinook salmon: e.g., >17% fines (<0.85mm) in gravel; e.g., >20% surface fines of ≤6mm. Turbidity High
	Chemical Contamination / Nutrients[3]	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches due to chemical or nutrient contamination.	Moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach due to chemical or nutrient contamination.	High levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach due to chemical or nutrient contamination.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
Habitat Access:	**Physical Barriers[4]** *The intent of this variable is to evaluate passage barriers to all life stages.	No human-made barriers present in watershed.	One or more human-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows.	Human-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows for at least one life history stage.
Habitat Elements:	**Substrate Character and /Embeddedness (in areas of the gravels and subsurface areas)[5]***The intent of this is to evaluate habitat quality for rearing.	Less than 15% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness less than 20%.	15% to 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and/or cobble embeddedness is 20% to 25%.	Greater than 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness greater than 25%.
	Large Woody Debris[6]	More than 40 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile AND current riparian vegetation condition near site potential for recruitment of large woody debris.	40 to 20 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile OR current riparian vegetation condition below site potential for recruitment of large woody debris.	Less than 20 pieces of large wood (>16 inches in diameter and > 50 feet in length) per mile AND current riparian vegetation condition well below site potential for recruitment of large woody debris.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Pool Frequency and Quality[4]	Pool frequency in a reach closely approximates the frequency values listed below and large woody debris recruitment standards for properly functioning habitat (above); pools have good cover and cool water, and only minor reduction of pool volume by fine sediment. Salmon and Steelhead: **channel width and pools/mile:** 5 ft. 184 pools/mi. 10 ft. 96 pools/mi. 15 ft. 70 pools/mi. 20 ft. 56 pools/mi. 25 ft. 47 pools/mi. 50 ft. 26 pools/mi. 75 ft. 23 pools/mi. 100 ft. 18 pools/mi.	Pool frequency is similar to values listed in "functioning appropriately", but large woody debris recruitment is inadequate to maintain pools over time; pools have inadequate cover/temperature, and/or there has been a moderate reduction of pool volume by fine sediment.	Pool frequency is considerably lower and does not meet values listed for "functioning appropriately"; also cover/temperature is inadequate, and there has been a major reduction of pool volume by fine sediment.
	Large Pools[4] (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow)	Each reach has many large pools >1 meter deep.	Reaches have few large pools (>1 meter) present.	Reaches have no deep pools (>1 meter).
	Off-channel Habitat[7] (evaluated for stream types that are not naturally entrenched)	Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas.	Watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas.	Watershed has few or no ponds, oxbows, backwaters, or other off-channel areas.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Refugia[4]	Habitats capable of supporting strong and significant populations are protected (e.g., by intact riparian reserves or conservation areas, ground water upwelling areas, and seeps); and are well distributed and connected for all life stages and forms of the species.	Habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species.	Adequate habitat refugia do not exist.
Channel Condition & Dynamics:	**Average Wetted Width/ Maximum Depth Ratio in scour pools in a reach**[8]	W/D ratio < 12 on all reaches that could otherwise best be described as 'A', 'G', and 'E' channel types. W/D ratio > 12 on all reaches that could otherwise best be described as 'B', 'F', and 'C' channel types. No braided streams formed due to excessive sediment load	Less than 25% of the surveyed reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in some alluvial reaches because of excessive aggradation due to high sediment loads.	More than 25% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in many alluvial reaches as a result of excessive aggradation due to high sediment loads
	Streambank Condition[9] (Based on USFS Region 5 Stream Condition Inventory Survey Methods)	> 90% stable; ie., on average, < 10% of banks are actively eroding.	80% - 90% stable	< 80% stable
	Floodplain Connectivity[4]	Off-channel/side channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation, and succession.	Severe reduction in hydrologic connectivity between off-channel/side channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation, and succession altered significantly.

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
Flow/ Hydrology:	**Change in Peak/ BaseFlows**[10]	Watershed is in condition class I according to the STNF Cumulative Watershed Effects (CWE) model. Watershed exhibits high hydrologic integrity relative to its natural potential condition.	Watershed is in condition class II according to the STNF CWE model. Watershed exhibits moderate hydrologic integrity relative to its natural potential condition.	Watershed is in condition class III according to the STNF CWE model. Watershed exhibits low hydrologic integrity relative to its natural potential condition.
	Increase in Drainage Network[4]	Zero or minimum increases in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).	Low to moderate increase in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).	Greater than moderate increase in active channel length correlated with human caused disturbance (e.g., trails, roadside ditches, compaction, impervious surface, etc).
Watershed Conditions:	**Road Density & Location**[4] **Disturbance History**[10] (Based on STNF ERA modeling)	Salmon and Steelhead: <2 mi/mi^2 CWE model shows that the watershed is in Condition Class 1. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains 15% or more Late Successional Old Growth habitat[11].	Salmon and Steelhead: 2-3 mi/mi^2 CWE model shows that the watershed is in condition class 2. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains 15% or more Late Successional Old Growth habitat11.	Salmon and Steelhead: >3 mi/mi^2 CWE model shows that the watershed is in condition class 3. Clarify and verify conditions and risk through field reviews and/or other available info, as available. The watershed contains less than 15% Late Successional Old Growth habitat[11].

Diagnostic or Pathway	Indicators	Properly Functioning	Functioning at Risk	Not Properly Functioning
	Riparian Reserves - Northwest Forest Plan[4]	Adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/ composition >50%.	Moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian conservation areas, or incomplete protection of habitats and refugia for sensitive aquatic species (70-80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/compositio n 25-50% or better.	Areas are fragmented, poorly connected, or provide inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/compositio n <25%.
	Disturbance Regime[4]	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. Natural processes are stable.	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. 1Natural processes are unstable.

Footnotes to Trinity River Tributaries Matrix of Factors and Indicators.

(1) **Stream Order according to Strahler (1957).** Proper Functioning criterion for 4th/5th Order streams derived from temperature monitoring near the mouth of streams considered to be pristine or nearly pristine (North Fork Trinity and New Rivers - 5th order, East Fork North Fork Trinity and New Rivers near East Fork- 4th order (Data on file at the Weaverville Ranger District). 7 day maximum temperatures as high as 71.8 degrees F have been recorded on these streams, however, the average is just less than 70 degrees F. At Risk criterion for 4th/5th order streams derived from monitoring in streams that support populations of anadromous fish, although temperatures in this range (70 to 73.0 degrees F) are considered sub-optimal. Not Properly Functioning is sustained temperatures above 73.0 degrees F that cause cessation of growth and approach lethal temperatures for salmon and steelhead.

Properly Functioning criterion for 1st - 3rd order streams is derived from Proper Functioning criterion for 3rd order streams derived from temperature monitoring near the mouth of streams considered to be pristine or nearly pristine (Devils Canyon Creek, East Fork New River, Slide Creek, Virgin Creek). At Risk and Not Properly Functioning are assigned on a temperature continuum with values given for 4th/5th order streams, with the maximum instantaneous temperature of At Risk of 1st - 3rd order streams coinciding with the minimum 7 day maximum of 4th/5th order At Risk streams. Similarly for the Not Properly Functioning category.

(2) **Properly Functioning:** Water clarity returns quickly (within several days) following peak flows.

At Risk: Water clarity slow to return following peak flows.

Not Properly Functioning: Water clarity poor for long periods of time following peak flows. Some suspended sediments occur even at low flows or baseflow.

(3) Criteria unchanged from the National Marine Fisheries Service (NMFS) matrix (NMFS 1996).

(4) **Properly Functioning criterion from Klamath Land and Resource Management Plan EIS p 3-68 (USDA 1995a).** At Risk and Not Properly Functioning criteria defined through professional judgment..

(5) **Properly Functioning LWD** criteria derived from stream surveys of 25 stream reaches on the Trinity River Management Unit. The reaches from which the properly functioning criteria were derived have not been "cleaned" or had extensive mining activity that removed LWD and support anadromous fish (or historically did). The Properly Functioning criterion is clearly defined, whereas the At Risk and Not Properly functioning criteria are ambiguously defined based on professional judgment of the Shasta-Trinity Level 1 team.

(6) Width to depth (W/D) ratio for various channel types is based on delineative criteria of Rosgen (1994). Properly Functioning means that W/D ratio falls within expected channel type as determined by the other four delineative factors (entrenchment, sinuosity, slope, and substrate). Aggradation on alluvial flats causing braiding is well known phenomenon that often accompanies changes in W/D ratio as watershed condition deteriorates.

(7) Criteria changed from NMFS matrix**.**

Shasta Trinity National Forest uses Equivalent Roaded Area/Threshold of Concern (ERA/TOC) Model (Haskins 1986) to determine the existing risk ratio as well as the effect risk ratio. Therefore, the ECA values are not used in Region 5 analysis; instead the ERA/TOC model is used. ERA/TOC provides a

simplified accounting system for tracking disturbances that affect watershed processes, in particular, estimates in changes in peak runoff flows influenced by disturbance activities. This model is not intended to be a process-based sediment model, however it does provide an indicator of watershed conditions. This model compares the current level of disturbance within a given watershed (expressed as %ERA) with the theoretical maximum disturbance level acceptable (expressed as %TOC). ERA/TOC (or "risk ratio") estimates the level of hydrological disturbance or relative risk of increased peak flows and consequent potential for channel alteration and general adverse watershed impacts. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability. The TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed.

Susceptibility of CWE generally increases from low to high as the level of land disturbing activities increase towards or past the TOC (FS Handbook, 2509.22-23.63a).

CWE Analysis Threshold of Concern and Watershed Condition Class: The LRMP established TOC for 5th field watersheds and defines Watershed Condition Class (WCC) (USDA Forest Service, 1995b). The WCC are defined as follows:

- Watershed Condition Class I: ERA less than 40 percent TOC;
- Watershed Condition Class II: ERA between 40 and 80 percent TOC; and
- Watershed Condition Class III: ERA greater than 80 percent TOC.

The following summarizes the FSM 2521.1 - Watershed Condition Classes. The ERA evaluates watershed condition and assigns one of the following three classes:

1. Class I Condition. Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.

2. Class II Condition. Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

3. Class III Condition. Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, riparian, and aquatic systems do not support beneficial uses.

(8) The components of the STNF CWE model (Haskins, 1986) are used to determine conditions and risk to this Indicator. The STNF CWE model components replace use of ECA that was originally identified in the Checklist. ECA is not used in Region 5.

References

Haskins, D.M. 1986. A Management Model for Evaluating Cumulative Watershed Effects; Proceedings from the California Watershed Management Conference, West Sacramento, CA, November 19-20, 1986, pp125-130.

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Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. American Geophysical Union Transactions. 38: 913-920.

USDA, Forest Service. 1995a. Klamath National Forest Land and Resource Management Plan Environmental Impact Statement. Klamath National Forest, Yreka CA.

USDA, Forest Service. 1995b. Shasta-Trinity National Forests Land and Resource Management Plan. Shasta-Trinity National Forests, Redding CA

Appendix B - Anadromous Salmonid and Pacific Lamprey Life History, Status, and Biological Requirements

SONCC Coho Salmon Life History Information

General life history information and biological requirements of Southern Oregon/Northern California Coastal (SONCC) Coho salmon have been described in various documents (Hassler 1987; Sandercock 1991; Weitkamp, *et al*. 1995) as well as NOAA-Fisheries' final rule listing SONCC Coho salmon (May 6, 1997; 62 FR 24588) and the recovery plan (NMFS 2014) for SONCC coho salmon.

Coho salmon enter the mainstem of the Klamath River for spawning typically in their third year, primarily between September and December, with a peak in October (NFMS 2007). Over most of this interval, mainstem flows below Iron Gate Dam often are high (ca. 2500-3000 cfs: NMFS 2001). Thus, standard methods for observing and counting spawning fish are not easily applied, and the size of the spawning population is unknown. Approximations put the entire ESU at about 10,000 spawning Coho salmon of non-hatchery origin per year (Weitkamp, *et al*. 1995), of which only a small portion is associated with the Klamath Basin, where several important tributary runs have been reduced to a handful of individuals (NMFS 2001, 2007). Although a minor amount of spawning and growth may occur in the mainstem, the mainstem serves adults primarily as a migration route (NFMS 2007).

Spawning occurs from November to January (Hassler 1987) in the tributaries to the Klamath River, but occasionally as late as February or March (Weitkamp, *et al*. 1995). Coho salmon eggs incubate for 35-50 days between November and March. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Fry start emerging from the gravel two to three weeks after hatching and move into shallow areas with vegetative or other cover. As fry grow larger, they disperse up or downstream. In summer, Coho salmon fry prefer pools or other slower velocity areas such as alcoves, with woody debris or overhanging vegetation. Juvenile Coho salmon over-winter in slow water habitat with cover as well. Juveniles may rear in fresh water for up to 15 months then migrate to the ocean as smolts from March to June (Weitkamp, *et al.* 1995). Coho salmon adults typically spend two years in the ocean before returning to their natal streams to spawn as three-year olds.

Available historical and most recent published Coho salmon abundance information are summarized in the NOAA-Fisheries coast-wide status review (Weitkamp, *et al*. 1995) and recovery plan (NMFS 2014). The rivers and tributaries in the California portion of this ESU were estimated to have average recent runs of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish. However, limited information exists regarding Coho salmon abundance in the Klamath River basin. What information exists [CDFW unpublished data; U.S. Fish and Wildlife Service (USFWS) unpublished data] suggests adult populations are small to nonexistent in most years. The decline of SONCC Coho salmon across the ESU is not the result of one single factor, but rather a number of natural and anthropogenic factors that include dam construction, instream flow alterations; land use activities coupled with large flood events, fish harvest and hatchery effects.

Designated critical habitat (CH) for Coho salmon encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk

River in Oregon, inclusive (May 5, 1999, 64 FR 24049). The area described in the final rule represented the current freshwater and estuarine range of Coho salmon. Land ownership patterns within the Coho salmon ESU analyzed in this document and spanning southern Oregon and northern California are 53% private lands; 36% Federal lands; 10% State and local lands; and 1% Tribal lands. The Forest Service manages about 1,680,000 acres (90.6%) of land within the Forest boundaries and about 200,000 acres (9.4%) of land are within the Forest boundaries but in other ownership (LRMP, Page 3-12).

SONCC Coho Salmon Key Limiting Stresses and Threats in the Action Area

The following information was summarized or excerpted from NMFS (2014) recovery plan for SONCC coho salmon:

Upper Trinity River

Several factors limit the viability of the Upper Trinity population. The most dominant of these factors stem from the effects of the large-scale dams, reservoirs, and diversion on hydrologic function. The juvenile life stage is the most limited and quality summer and winter rearing habitat is lacking for the population. In addition, the negative impacts of Trinity River Hatchery, altered floodplain and channel structure, and the lack of habitat access upstream of Lewiston Dam create substantial stresses to the Upper Trinity River coho salmon population. Heating of water in Lewiston Reservoir during the summer months contributes to limiting the amount of habitat available to rearing juvenile coho salmon in the mainstem Trinity River.

Altered hydrologic function has a major impact on the productivity of this population. Rearing opportunities and capacity are low due to a reduced and dampened flow regime. Loss of flow variability and reduced rearing habitat during the fall and winter months as a result of water storage and regulation is expected to reduce the ability of the habitat in the Upper Trinity River to support winter rearing of juvenile coho salmon. Water withdrawals from important tributaries like Weaver and Rush creeks reduce baseflows in the summer and fall months, contributing to low flows and high water temperatures.

Water quality in the Upper Trinity is primarily impacted on a localized basis by fine sediment loading and temperature impairments. It is likely that within the mainstem Trinity River, the distribution of coho salmon can be explained, at least in part, by water temperature. Although mainstem water temperatures during the summer months in the Upper Trinity River are generally cool downstream to roughly Douglas City, temperatures can be problematic during years when storage in Trinity Reservoir is low, tributary runoff is low, or air temperatures are high for long durations.

Riparian forest conditions present medium to low stresses across all life history stages. Where data exist, the assessment of streamside canopy cover ranges from fair to very good throughout the watershed. The Weaver and Helena areas appear to have fair riparian conditions, while portions of the Helena and Upper Trinity areas have very good riparian conditions.

Altered sediment supply presents Low to Medium stress across all life history stages. The

mainstem has an oversupply of sediments because of hydraulic mining, dredging, timber harvest, and road building. Excessive fine sediment in tributaries and the mainstem have limited coho salmon habitat by infiltrating spawning gravel and increasing egg and alevin mortality,

depositing on exposed cobble bars and impacting coho salmon fry and over-wintering rearing habitat, and filling pools and off-channel habitat and limiting juvenile summer rearing habitat (Graham Matthews and Associates (GMA) 2001). The majority of fine sediment in the Trinity River originates from roads, timber harvest, and natural sediment loading from landslides and erosion (USEPA 2001).

Roads are a moderate to high threat across most life history stages. Data indicate road density varies from Very High to Low across the watershed. Most of the habitat with the greatest potential to support coho salmon in this area occurs in areas with road densities greater than 2.5 miles/sq. mile, and much of that habitat is in areas with greater than 3 miles/sq. mile. Given the sedimentation problems seen in the watershed, roads should be considered for removal or upgrade to reduce sediment delivery. Of particular importance are the many roads in the Weaverville and Douglas City areas, where small tributary streams containing reaches with high or medium IP value are accessible to coho salmon.

Timber harvest poses a medium threat to the Upper Trinity River population. Much of the population area is in public ownership (U.S. Forest Service and Bureau of Land Management), including a substantial portion of federally-designated Wilderness. Timber practices are governed by the rigorous protective measures for water quality that are required for actions on public lands under the Northwest Forest Plan Aquatic Conservation Strategy and Standards and Guidelines.

The two key limiting threats (the source of stresses above), those which most affect recovery of the population by influencing stresses, are hatcheries and dams/diversions.

South Fork Trinity River

The following information was excerpted or summarized from NMFS (2014):

The presence of coho salmon has been confirmed in a variety of streams in the Upper Trinity River Sub-basin such as Grass Valley Creek, Sidney Gulch, Deadwood Creek, Rush Creek, Weaver Creek, East Weaver Creek, West Weaver Creek, Little Browns Creek, Sidney Gulch, Dutch Creek, Soldier Creek, Canyon Creek, North Fork Trinity River, East Fork North Fork Trinity River, Manzanita Creek, Big French Creek, New River and East Fork New River (Hill 2008; Everest 2008). Coho salmon are also likely to be found in Reading and Browns creeks.

Several factors limit the viability of the South Fork Trinity River coho salmon population. The most dominant of these factors stem from the effects of agricultural practices on private land, legacy sediment-related impacts from past floods, fire, and land management. Impaired water quality and altered hydrologic function are the most likely stresses limiting productivity of the South Fork Trinity population. Juveniles are the most likely limited life stage due to the poor summer rearing conditions.

The majority of high IP habitat exists on private land in the Hayfork Valley. This area is characterized by poor water quality, a lack of hydrologic function, sedimentation and high water temperatures. Riparian vegetation is reestablishing in some smaller tributaries and is expected to experience improved water quality in the future (e.g., Sulphur Glade Creek). However many of these streams lack the flow and/or habitat requirements of juvenile coho salmon. High levels of fine sediment indicate that excessive sediment may also be a major limiting factor in some

tributaries and mainstem reaches, for example, the South Fork Trinity River near Hyampom and Hayfork Creek (Gilroy et al. 1992, Dresser et al. 2001). Many streams exhibiting higher channel gradients have flushed substantial amounts of introduced coarse sediment, similar to a pattern of recovery described by Lisle (1981) and Hagans et al. (1986). Channel recovery is exacerbated by continued delivery of more sediment than the channel can transport. Headwater streams have also, in some cases, experienced re-growth of riparian zones that has promoted lower stream temperatures. However, reaches of the mainstem South Fork Trinity River upstream of lower Hyampom Valley, and lower Hayfork Creek, seem to be lagging in recovery both in terms of flushing recently introduced sediment and lowering water temperatures (Dale 1990).

Water quality and water yield appear to be the main limiting factors to fisheries recovery in the potentially productive Hayfork Creek watershed. In order to improve the viability of this population it will be imperative to improve habitat conditions for juveniles and adults, and address the issues related to straying hatchery adults. Vital habitat for the South Fork Trinity coho salmon population exists in areas that provide thermal refugia for juveniles in the summer and in areas with relatively intact habitat features such as clean spawning gravel, functional floodplain and channel structure, and established riparian forest. Potential coho salmon refugia areas exist at many stream confluences with the South Fork Trinity River. Madden Creek provides excellent refugia for juvenile and adult coho salmon in the lower South Fork Trinity River (Boberg 2008). It has cool, clean water that originates in the mountains of the Six Rivers National Forest and moderates the high temperature of the South Fork Trinity River in the summer months near the confluence of the two waterways. At times, hundreds of juvenile salmonids congregate in this area.

Altered sediment supply presents a high stress for most life stages. The 1964 flood resulted in widespread erosion in the mainstem South Fork Trinity River and many tributaries. Adding to these effects was the extensive harvesting of steep inner gorge slopes and widespread land disturbance. Many basins still suffer from chronic erosion and sedimentation as well as thick deposits of stored sediment and resultant wide, shallow streambeds (PWA 1994). Although the 1964 flood delivered substantial sediment to the South Fork Trinity River, there is evidence that some sites affected by the 1964 flood have since downcut to pre-flood levels (Dresser et al. 2001). In areas where sediment loading is still ongoing, sediment has filled pools, widened channels, and simplified stream habitat. In many reaches, aggradation reduced surface flows, potentially limiting access to migrating juveniles. Stream channels with the greatest fine sediment accumulations in pools and with associated low juvenile fish densities include lower Salt Creek, Hayfork Creek above 9-mile bridge, the entire main stem, East Fork South Fork and Grouse Creek (PWA 1994). Sediment loading is greatest in the Hyampom Valley, with most of the sediment being delivered from South Fork Mountain tributaries. The Grouse Creek and Pelletreau Creek sub-watersheds, both of which have been heavily logged since the 1940s, are both major sediment contributors (PWA 1994). Hillslope inputs seem to have declined dramatically, indicating that upslope conditions are recovering (Raines 1999, Dresser et al. 2001). There has been some indication that fine sediment levels may be limiting for fish, and it is thought that pools are too shallow now for temperature stratification (Gilroy et al. 1992, PWA 1994). Federally managed watersheds in which cumulative erosion and sedimentation effects are likely to be problems include Butter Creek, Rattlesnake Creek, Plummer Creek, South Fork

Mountain Tributaries, East Fork South Fork, Upper South Fork, Hidden Valley, Upper Hayfork Creek, Hyampom and Gulch watersheds.

Water quality primarily affects fish and fish habitat in the mainstem South Fork Trinity River and in Hayfork Creek. In Hayfork Creek, water diversion, agricultural practices, residential septic systems, and industrial pollution all contribute to impaired water quality. Water temperature in Hayfork Creek and the mainstem South Fork Trinity can reach levels stressful or even lethal (>17 °C) for rearing coho salmon in the summer months (PWA 1994; USFS 1990). Hayfork Creek contributes to poor water temperatures in the mainstem (PWA 1994). In addition to temperature, turbidity effects have been found in the more erodible portions of the basin in the Upper and Lower South Fork sub-basins, particularly west of the mainstem, and in areas where land management practices are most intense (PWA 1994). Other tributaries including, but not limited to Salt Creek, Rattlesnake Creek, Post Creek, Rusch Creek, Tule Creek also suffer from high stream temperatures and associated low dissolved oxygen in the summer months.

Flows are naturally low during the summer due to the low elevations in the basin, the bedrock geology and the low water holding capacity. The summers are hot and dry for several months and there is often little water flowing in most creeks during the summer (USFS 1996c). Exacerbating this issue is the substantial water utilization in the South Fork Trinity River, especially Hayfork Creek and its tributaries (PWA 1994), and Rattlesnake Creek (Wiseman, E., pers. comm. 2011) which has caused reductions in the amount of habitat available to rearing juvenile salmon in the summer and restricted access to spawning grounds in the fall. Hayfork Creek below the East Fork has been designated as a critical water shortage area (PWA 1994). In past surveys, the U.S. Forest Service assessed riparian areas and identified watersheds that have more than 15 percent of their riparian zone acreage with low LWD recruitment potential and low shade. From least (17 percent) to greatest (30 percent) were Butter, Corral, Upper S.F. Trinity, Plummer, Lower Hayfork, Eltapom, Rattlesnake, Hidden Valley, Upper Hayfork, and Salt. Grouse Creek and Eltapom Creek in the Crouse Creek HSA, Naufus, Indian Valley, Dobbins, Rattlesnake, and Salt Creeks also show signs of low LWD recruitment. The Upper South Fork, by comparison, has a riparian forest composed largely of Douglas fir and White fir, with canopy closures ranging between 70 percent and 80 percent. Future LWD recruitment in these stands is excellent, with some of the highest recorded volume measurements in the Trinity Basin (USFS 1999c).

The two key limiting threats (the sources of stresses described above), those which most affect recovery of the population by influencing stresses, are roads and dams/diversions.

SONCC Coho Salmon Critical Habitat

CH is defined in section 3(5)(A) of the ESA as "(i) the specific areas within the geographical area occupied by the species at the time it is listed ... on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed ... upon a determination by the Secretary of Commerce (Secretary) that such areas are essential for the conservation of the species" [16 U.S.C. 1532(5)(A)]. The term "conservation," as defined in section 3(3) of the ESA, means " ... to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at

which the measures provided pursuant to this Act are no longer necessary" [16 U.S.C. 1532(3)]. Therefore, CH includes geographic areas and habitat functions necessary for the recovery of the species.

CH for SONCC coho salmon encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Elk River in Oregon and the Mattole River in California, inclusive (May 5, 1999 64 FR 24049). Excluded from SONCC coho salmon CH are: (1) areas above specific dams identified in the FR notice; (2) areas above longstanding natural impassible barriers (i.e., natural waterfalls in existence for at least several hundred years); and (3) tribal lands. The final rule designating SONCC coho salmon CH (May 5, 1999, 64 FR 24049) indicated that the essential habitat types for: (1) juvenile summer and winter rearing areas and adult spawning are often located in small headwater streams and side channels; (2) juvenile migration corridors and adult migration corridors include the small headwater streams and side channels as well as mainstem reaches and estuarine zones; and (3) growth and development to adulthood occurs primarily in near- and off-shore marine waters, although final maturation takes place in freshwater tributaries when the adults return to spawn. For the purpose of this consultation, "essential habitat types" represent the primary constituent elements (PCEs) of SONCC coho salmon CH. Within the PCEs, essential features of SONCC coho salmon CH include adequate: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions.

The Environmental Baseline section of the BA describes habitat conditions within the action area. The Effects of the Action section is organized around anticipated effects on SONCC coho salmon habitat indicators including their CH. The AP habitat indicators are used in the BA to analyze effects to coho salmon PCEs.

Chinook Salmon Life History Information

The following information was excerpted or summarized from NMFS status review of Chinook salmon (Meyers, *et al.* 1998). Chinook salmon mature between 2 and 6+ years of age (Meyers, *et al.* 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Incubation temperature for eggs is 5.0 to 14.4°C, with below 13.0°C preferred for optimal development in most stocks (McCullough 1999). Emerging fry generally do not develop normally above 12.8°C (McCullough 1999). Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. Once feeding, the optimal growth range for juveniles is 10.0 to 15.6°C, with fingerlings preferring to hold at 12 to 14°C (McCullough 1999). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. For Chinook salmon, the recommended maximum temperature to maintain migratory response and seaward adaptation is 12.0°C; and at temperatures greater than 13.0°C, some physiological processes of smolting may be delayed, and, in extreme cases, reversed (McCullough 1999). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Meyers, *et al*. 1998). Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return.

The UKT ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin upstream of the confluence of the Klamath and Trinity rivers. Historically, spring-run Chinook salmon were probably the predominate run. This ESU still retains several distinct spring-run populations, albeit

at much reduced abundance levels. Fish from this ESU exhibit an ocean-type life history; however genetically and physically, these fish are quite distinct from coastal and Central Valley Chinook salmon ESUs. Genetic analysis indicated that this ESU form a unique group that is quite distinctive compared to neighboring ESUs. The majority of spring- and fall-run fish emigrate to the marine environment primarily as subyearlings, but have a significant proportion of yearling smolts. Recoveries of coded wire tags indicate that both runs have a coastal distribution off the California and Oregon coasts.

Essential Fish Habitat - Coho and Chinook Salmon

Essential Fish Habitat (EFH) is considered in the BA for both coho and Chinook salmon, with consultation occurring under 305 (b) (4) (A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). The definition of coho/Chinook EFH components and extent is described by Amendment 14 (Appendix A, pages 12-35 [adopted year 2000]) of the 1978 Pacific Fisheries Management Council Salmon Fisheries Management Plan. EFH is defined by those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity for species managed in Fishery Management Plans under the MSFCMA. EFH is the habitat necessary for managed fish to complete their life cycle, thus contributing to a fishery that can be harvested sustainably. Different life stages of the same species often use different habitats. NMFS has interpreted through regulation that EFH must be described and identified for each federally managed species at all life stages for which information is available. The BA assesses effects to EFH using AP habitat indicators as described in Section V. (Effects of the Action) of the BA. Other than an adverse effects determination to EFH, effects to EFH are framed as either unlikely, immeasurable, or undetectable. Effects to EFH would never be entirely beneficial, since such instances would not require EFH consultation.

EFH for Coho and Chinook salmon occurs within the action area, and is identical to the distribution of Coho salmon CH as shown on maps in Appendix A. The extent of EFH is a conservative over-estimate of extent because the distribution of steelhead was used as a surrogate to identify and map EFH (and CH). The STNF recognizes that coho and Chinook salmon may not occupy the same waters as steelhead because of the difference in their jumping abilities. The maximum jumping height for coho salmon is 2.2 meters, Chinook salmon maximum jumping height is 2.4 meters, and steelhead maximum jumping height is 3.4 meters (Meehan, 1991). Therefore, steelhead can occupy more stream reaches than coho or Chinook salmon. The use of the STNF steelhead distribution layer to define EFH (and CH) is recognized as a conservative approach for assessment of effects to coho and Chinook salmon EFH. All fish and habitat distribution information is based on existing survey information collected by or verified by STNF fisheries biologists.

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Pacific Lamprey

The Pacific lamprey is an anadromous and parasitic fish widely distributed in Pacific coast streams from Japan through Alaska and down the western North America coast to Baja California.[1]Pacific lampreys are jawless fish with a cylindrical body and sectorial disk mouth; they lack paired fins, vertebrae and swim bladders. Swimming is accomplished through lateral undulations of the body from nose to tail (anguilliform swimming). Their sectorial disk allows them to attach to surfaces, release and propel forward with a swimming burst, and re-attach to a new surface. Thus, they can maneuver over obstacles and move upstream through high water velocities.[2]

Anadromous Pacific lamprey in the adult life stage spend up to 3 years in the ocean. Landlocked forms spend their adult life stage in lakes or reservoirs. Adults migrate up rivers and streams to spawn, generally in March through July, and die after spawning. Spawning habitat consists of gravel beds in low to moderate gradient stream reaches and may have relatively high sand and silt content. In the larval stage, Pacific lamprey burrow into mud, sand and fine gravels located in slow, depositional areas (e.g. pools, eddies), spending 4-6 years, filter feeding on algae, diatoms, detritus and other microscopic organisms.[3]

Pacific lamprey juveniles transform into sub-adults and out-migrate to the ocean during rising stream flows in later winter or early spring. Parasitic tooth development occurs during this transformation, prior to them entering salt water. Once in salt water, adults feed on a variety of marine and anadromous fish, and are preyed upon by sharks, sea lions, birds and other marine mammals.[4]

The abundance and distribution of Pacific lamprey has significantly declined throughout its range over the past three decades. Many factors have contributed to this decline, including: impeded passage and entrainment at dams and water diversion structures, altered stream flows and dewatering of stream reaches, dredging, chemical poisoning, poor ocean conditions, degraded water quality, disease, over-utilization, introduction and establishment of non-native fishes, predation, and stream and floodplain degradation.[5]

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[1]USFWS 2010 and Moyle 2002

[2]USFWS 2010

[3]Close and others 2002, Moyle 2002 and USFWS 2010

[4]USFWS 2004 and USFWS 2010

[5]Luzier et al 2009 in USFWS 2010

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APPENDIX C

NATIONAL MARINE FISHERIES SERVICE

WATER DRAFTING REGULATIONS IN ANADROMOUS

FISH WATERS

WATER-DRAFTING SPECIFICATIONS

National Marine Fish Service
Southwest Region

August 2001

"Water-drafting" is a short-duration, small-pump operation that withdraws water from streams or impoundments to fill conventional tank trucks or trailers. Usually, this water is used to control road dust, or for wildfire management.[1] Short term water drafting is also used to temporarily de- water a construction site, or to temporarily divert water around a construction site.

The specifications below are given primarily for the protection of juvenile anadromous salmonids, in waters where they are known to exist; but they also may be applied to protect a host of other aquatic organisms as well. The issue of sufficient in-stream flow for life support of the aquatic ecosystem should be addressed by a local Fish & Game biologist. Temporal and cumulative effects should be considered on a watershed scale. While we give some guidelines in that area, the actual impact of water drafting on stream ecology should be assessed and monitored at the local level by qualified personnel.

The main focus of this guidance is the construction, operation, and maintenance of a fish screen module(s) that must be installed at the in-stream end of the drafting hose to protect small salmon and steelhead fry from being entrained in the hose, or impinged on the surface of the screen. The specifications are based on the critical "approach velocity" at the screen surface[2], and a recognition that many temporary screens will not be outfitted with automatic cleaning devices to remove debris buildup. Since it is difficult to measure water velocities in the field, only the

construction, pumping capacities, and operations are specified. Variances from these specifications may be considered, but only on a case-by-case basis.

Operating Guidelines

1. Operations are restricted to one hour after sunrise to one hour before sunset.[3]
2. Pumping rate shall not exceed 350 gallons per minute.
3. The pumping rate shall not exceed ten percent of the stream flow.[4]
4. Seek streams and pools where water is deep and flowing, as opposed to streams with low flow and small isolated pools.
5. Pumping shall be terminated when the tank is full. The effect of single pumping operations, or multiple pumping operations at the same location, shall not result in obvious draw-down of either upstream or downstream pools.
6. Each pumping operation shall use a fish screen. The screen face should be oriented parallel to flow for best screening performance. The screen shall be designed and used such that it can be submerged with at least one-screen-height-clearance above and below the screen.
7. Operators shall keep a log on the truck containing the following information: *Operator's Name, Date, Time, Pump Rate, Filling Time, Screen Cleaned (Y or N), Screen Condition, Comments.* These guidelines should be included as instructions in a logbook with serially numbered pages. This assures each truck operator easy access to this information.

Screen Construction Criteria

1. Surface Area

The total (unobstructed) surface area of the screen shall be at least 2.5 square feet, based on the upper limit of pumping of 350 gpm[5]. Larger surface areas are recommended where debris buildup is anticipated, and where stream depth is adequate to keep the screen submerged at approximately mid-depth.

2. Screen Mesh

Screen Mesh must be in good repair and present a sealed, positive barrier- effectively preventing entry of the "design fish" into the intake. The design fish in this case is a immature (20-30mm) salmon or steelhead fry.

The screen mesh size shall be:
Round openings - maximum 3/32 inch diameter (.09 inch)
Square openings - maximum 3/32 inch diagonal (.09 inch)
Slotted openings - maximum 1/16 inch width (.07 inch)

3. Screen Design

Water drafting screens may be off-the-shelf products, but they are often custom-made devices appropriate to the scale and duration of pumping operation. To keep the screen supported and correctly positioned in the water column, adjustable support legs are advised. Screen geometry can be configured either as rectangular or cylindrical, i.e.- as a shallow "box-shape" or tubular.

The intake structure shall be designed to promote uniform velocity distribution at all external mesh surfaces. This can be accomplished with a simple internal baffle device that distributes the flow evenly across the entire surface of the screen. In order to accomplish this, the designer needs to understand the hydraulic characteristics of these devices. There is a tendency for most of the intake water to enter the screen near the hose end, so a typical internal baffle would consist of a pipe (or a manifolded set of pipes) which have variable porosity holes at predetermined spacing. We recommend starting near the hose end with approximately 5-10% average open area, and gradually increasing the porosity toward the length of the screen. At a point where screen length exceeds three times the diameter of the suction hose, the baffling effect tends to diminish rapidly. At this point the baffle porosity may approach 100%. A successful baffle system will functionally distribute flow to all areas of the screen. A poorly designed screen may result in high-velocity "hot spots," which could lead to fish impingement on the screen face. Hydraulic testing of prototype screen designs is recommended where the application is on-going and extensive.

4. Screen Structure

The screen frame must be strong enough to withstand the hydraulic forces it will experience. However, structural frames, braces, and other elements that block the flow, change flow direction, or otherwise decrease the screen surface area should be minimized.

5. Screen Cleaning

The screen shall be cleaned as often as necessary to prevent approach velocity from exceeding 0.33 feet per second. Operators should withdraw the screen and clean it after each use, or as necessary to keep screen face free of debris. Pumping should stop for screen cleaning when approximately fifteen percent or more of the screen area is occluded by debris. A suitable brush shall be on board the truck for this cleaning operation.

If the operator notes (a) impingement of any juvenile fish on the screen face or (b) entrainment of any fish through the screen mesh, he/she should stop operations and notify the Department of Fish & Game and/or NMFS hydraulic engineering staff :

National Marine Fisheries Service
Engineering Section
777 Sonoma Avenue, Suite 325
Santa Rosa, CA. 95404
(707) 575-6050

Rebecca Lent, Ph.D.
Regional Administrator

[1] In case of emergency wildfire, where human life is in danger, the operator may disregard the screening requirement if a suitable screen is not immediately accessible.

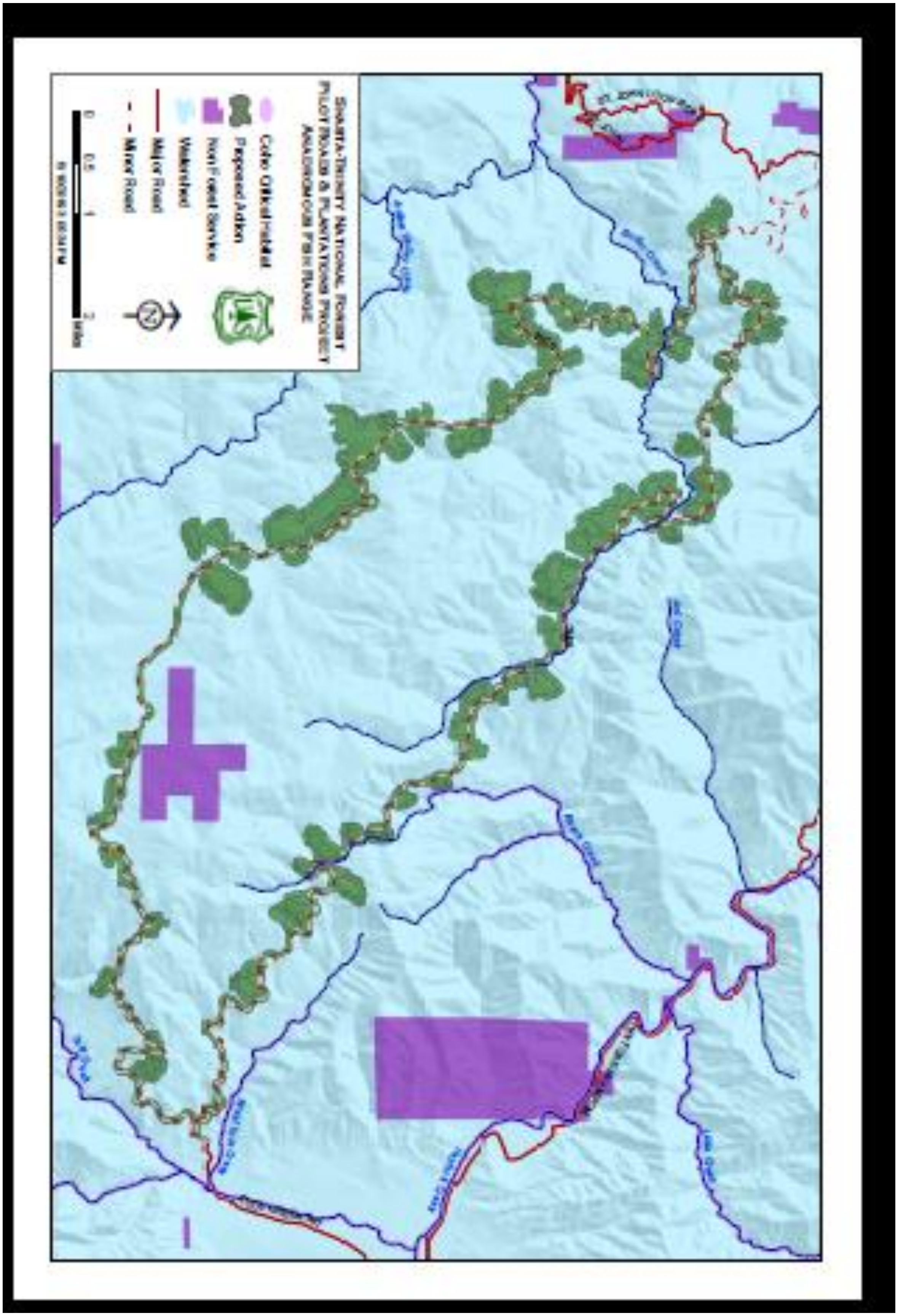
[2] Approach velocity is the horizontal velocity vector component, typically measured at a distance of 3 inches from the screen face.

[3] Restricting operations to daylight-only prevents the use of lights that will attract fish to the drafting pool

[4] Restricting drafting to ten percent of the stream flow provides adequate downstream flow to support fish, aquatic insects, amphibians, and other biota. Ten percent of flow may be estimated by pump operators.

APPENDIX D

PROJECT MAP


SHASTA-TRINITY NATIONAL FOREST
PILOT ROADS & PLANTATIONS PROJECT
ANADROMOUS FISH RANGE
Coho Critical Habitat
Proposed Action
Non Forest Service
Watershed
Major Road
Minor Road
0
0.5
1
2
Miles